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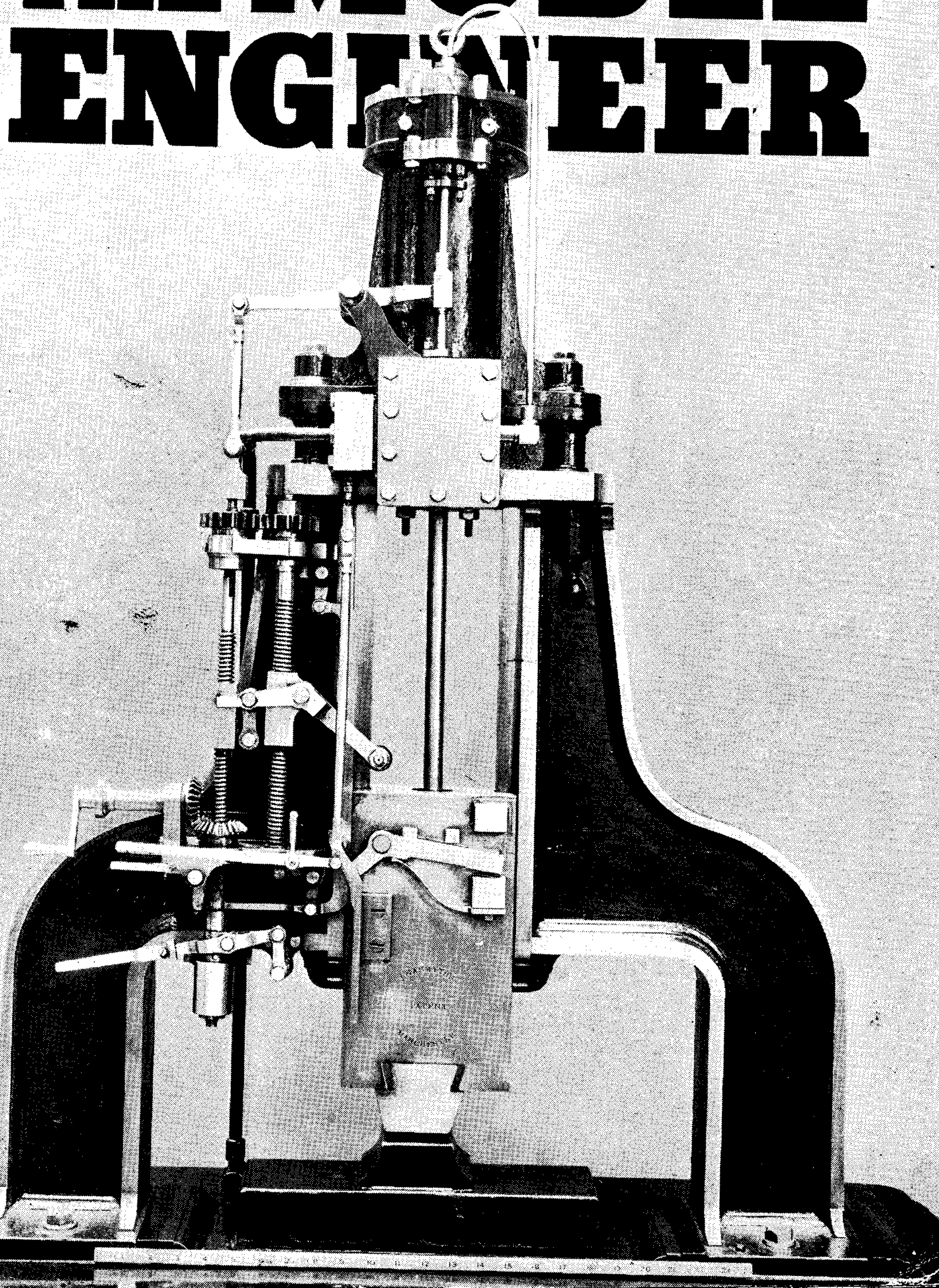
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

10TH JULY 1952 VOL. 107 NO. 2668

SMOKE RINGS

Our Cover Picture

● SHOWS a model of the original steam hammer invented by James Nasmyth about 1839 and patented in 1842.

The valve gear for regulating the number and strength of blows is arranged for working automatically. The slide valve of the hammer is connected with a small overhead steam cylinder, which always acts in such a way as to allow steam to enter below the hammer piston and so keep the tup "up"; but a tappet on the tup, when a certain height has been reached, strikes a lever which reverses the slide valve and so lets the hammer fall!

A copy of the original sketch by James Nasmyth of his first conceptions of the steam hammer is exhibited in the Science Museum at South Kensington.

As a matter of interest, and for the purpose of comparison, readers should turn to other pages in this issue for an illustrated description by our contributor, "Northerner," of a model Massey self-acting steam hammer that was on show recently at an exhibition in Manchester.

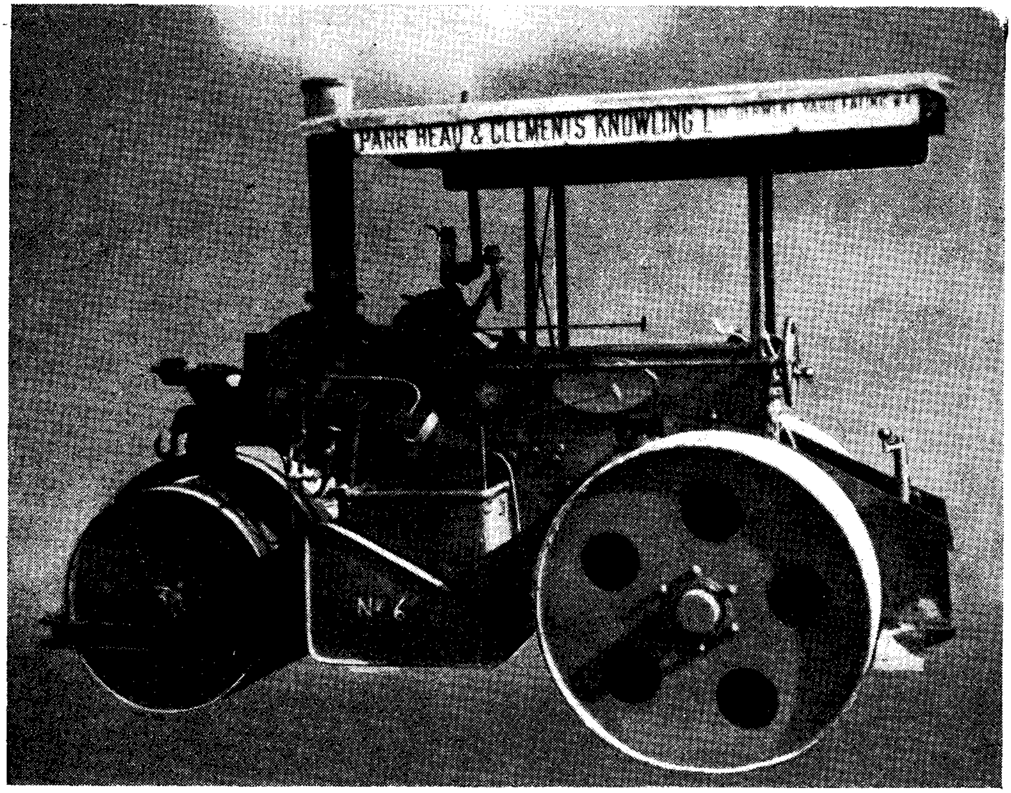
Crown Copyright. From an exhibit in the Science Museum, South Kensington.

These Controversies!

● ONE OF our overseas readers, in a long and interesting letter, expresses the opinion that our "Practical Letters" columns contain too much unnecessary and undesirable controversy. He suggests that most of the controversial topics which are debated at length in these columns, could be settled by an "authoritative statement" on the subject by the Editor. We do not think the majority of our readers would entirely agree with this opinion. The "Practical Letters" are among the most popular and time-honoured features of THE MODEL ENGINEER; they have always been regarded as a forum for the exchange of views on technical topics, and have been a means of bringing to light many interesting facts and ideas which might otherwise have remained in obscurity. Few of the subjects debated could have been settled by dogma or undisputed fact; our personal experience of "authoritative statements" has led us to view them with suspicion, and we imagine many readers share our views. Occasionally we may find it necessary to use editorial authority to terminate a discussion which has ceased to be productive, or promises to become interminable; sometimes the blue pencil must be wielded to excise passages which encroach on the borders of good taste, or may be taken as personal innuendo. Controversy is a good and healthy sign that readers are sitting up and taking notice of the contents of the journal, and so long as it is kept to the subject, is to be encouraged. Space does not permit of publishing more than a fraction of the interesting letters we receive, but so far as possible, all readers who have anything useful to say are given a hearing. Incidentally, these letters also provide an opportunity for us to demonstrate that "the customer is always right"—in other words, that the opinions of our readers are valued, and are given due consideration in shaping the editorial policy of this journal.

An Inclined-boiler Steamroller

● THE REPRODUCED photograph was taken by Mr. J. Bryant, of Alperton, as recently as last March. It shows a small road roller which was working in the Harrow Road, at the junction of the North Circular Road, Stonebridge. The peculiar feature is the steeply inclined boiler, the reason for which was, not to keep a safe water-level when descending a steep hill, but to keep the total length of the whole machine as short as possible.



Wallis & Steevens Ltd., of Basingstoke, were, we believe, the only manufacturers who built this type of roller. The one seen in Mr. Bryant's photograph belongs to Parr-Head & Clements Knowling Ltd., of Ealing, and is thought to be the only one of its type now at work.

An Instantaneous Recollection

● A READER in Devon, signing himself "C.W.N.", has sent us the following story :—

It was Sunday afternoon. After some years of work, started by discovering (after picking up some copies of THE MODEL ENGINEER), that an ordinary chap could, with an ordinary file and an ordinary hacksaw, not merely shape, but cut such immutable looking stuff as steel and bronze, and following, by reading "L.B.S.C." word by word, a completed locomotive chassis stood on the friend's garage bench ready for testing on his air compressor.

The never to be forgotten moment when the air was turned on and the wheels spun round was disturbed by the stranger, whose line of approach was across the air line looped from the steamchest to the far wall, dashing across to see the fun.

My hand grabbed the line close to the steamchest, but the expected vicious jerk did not come. On looking round, the friend was seen to have jumped on to the spot where the line touched the floor between the stranger and the engine.

"It's a funny thing," I said as the stranger picked himself up, "as that chap moved, I suddenly thought of a story I read in THE MODEL ENGINEER——"

"Yes," said the friend, "the one about the locomotive wrecked on a concrete floor by a dog running into the air line. I thought of it, too, that's why I jumped on this one."

It is hardly necessary to add thanks to the gentleman who took the trouble to send that story to THE MODEL ENGINEER, or to the Editor for printing it.

To Prospective Correspondents

● WE OFTEN receive letters from readers asking us to supply the addresses of contributors and, just as often, we have to reply that, as a matter of form, we are unable to give such information. What we *can* do, however, is to forward any letters addressed to contributors care of this office.

The "Warrior" Mark 2 Engine

by W. Cullum

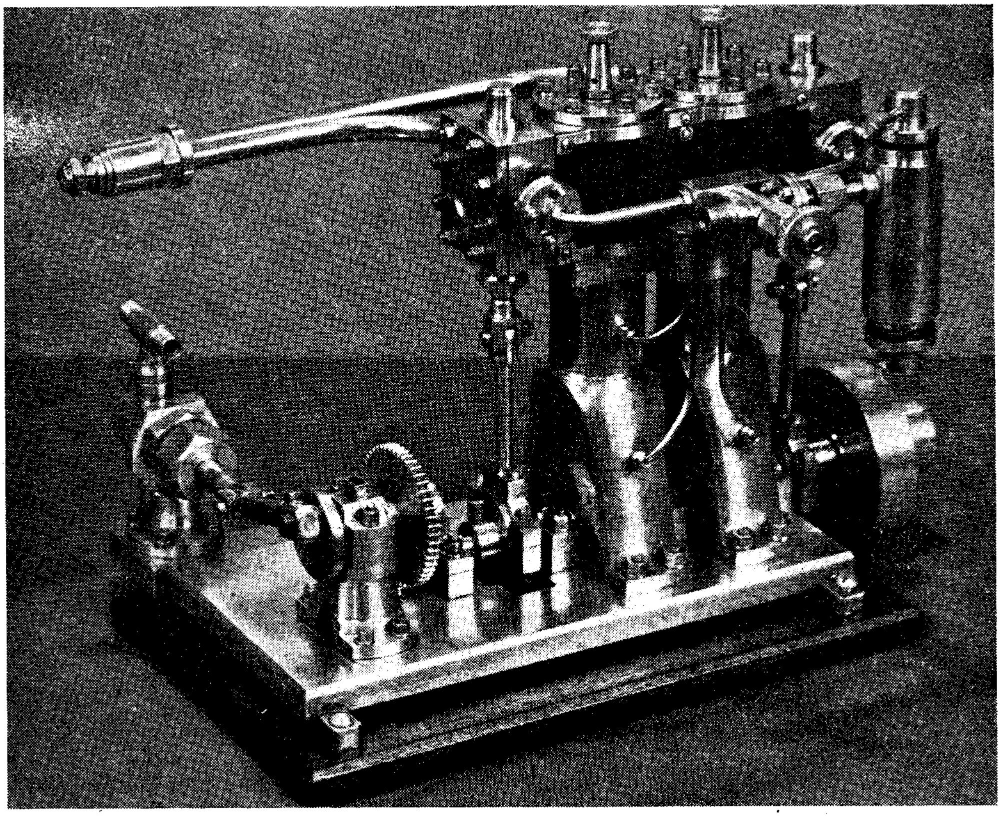
IT is with a certain amount of pleasure and satisfaction that I submit two photographs of the Warrior Mk. 2 engine which I have recently completed.

When I saw the advertisement of the Imperio Co. for sets of castings, I remembered that I had an article describing the building of this same engine written by Mr. Westbury, and, therefore, lost no time in obtaining a set, knowing that I couldn't go far wrong with so much technical advice at hand.

Readers who know the engine will notice that I have made one or two alterations from the original plan, although the design in itself has not been altered.

The slotted driving dog is flanged and bolted to the flywheel with six steel studs and nuts. The flywheel has, therefore, not been drilled and tapped in order to fasten it to the crankshaft. Only one grub-screw in the driving dog is used, and the surface of the flywheel is not spoilt by an untidy hole.

The oil box lubricating the trunk guides and cranks has been reduced, and two smaller ones have been made one at each side of the engine. This little alteration saved the bending of the feed pipes from one side of the engine to the other, and also gave the cylinders a better appearance from the exhaust side.



It may be noticed that both steam and exhaust pipes are changed over, I reversed the order of these because the steam connection from the boiler was situated at that side, and I wanted to keep the steam pipe as short as possible.

The two exhaust pipes were soldered into a small brass plate, and pressed into the fitting shown on the photograph. The inside of this fitting is taper bored, and joins up with a single pipe which leads to the uptake of the boiler.

The pump is made from a drawing by our friend "L.B.S.C." and was completed many weeks before the engine was begun. This, by the way, gave me a little trouble because I found that it was impossible to mount it on the

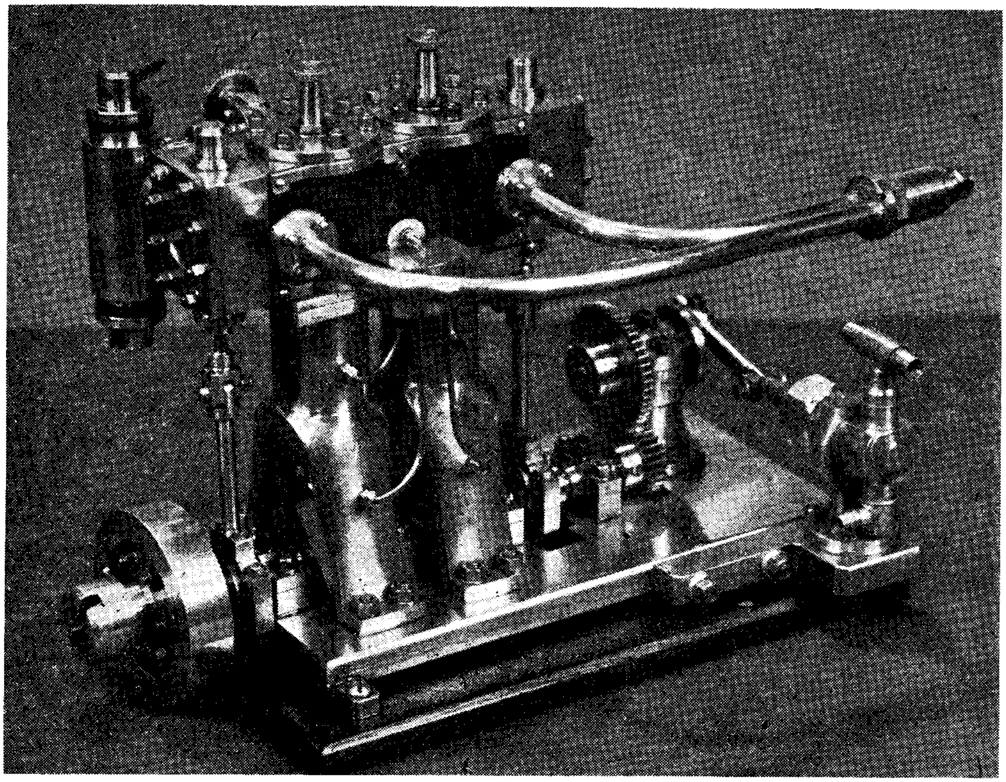
engine bed supplied with the castings.

This was a disappointment because I had spent many hours fettling and surfacing the casting. Not to be defeated I made another bed out of a piece of flat brass 6 in. × 3 in. × $\frac{5}{16}$ in. and even then I had to bolt on an extra piece to accommodate the pump itself.

The pump I made from the solid, using $\frac{3}{4}$-in. brass rod for the barrel and $\frac{5}{16}$ in. for the valve box. I first drilled a $\frac{5}{16}$-in. hole through the $\frac{3}{4}$ in. diameter round rod and turned up a piece of $\frac{3}{8}$-in. rod for a tight fit, after that I followed instructions as specified for the locomotive

I find these fittings most reliable and steam-tight when the valves are closed, and when open the water escapes through two holes bored at each side.

They have another use which is most helpful to beginners like myself. In theory, and even in practice the slide-valve should be pressed against the port face when steam enters the steam-chest; I have found by experience that if there is a little tolerance between the valve nut, and the bottom of the slot, the steam pressure will cant the valve, and allow the steam to pass through to the exhaust.



Juliet, and believe me it was worth making. With the engine running, this pump shoots water out like a fire engine.

The gearing is "Meccano," both wheels being rebossed to take the different sizes of shafts. These bosses were first soldered into position and pinned with $\frac{1}{16}$-in. steel pins; the large wheel is two wheels joined together, soft-soldered and pinned with four $\frac{1}{16}$-in. steel pins.

For the steam cocks on the cylinders I have substituted relief-valves. These are similar in construction to safety-valves, with the exception of the ball-valve which is pressed to the seating by the milled wheel at the top.

The wheel spindle is hollow and sleeves over a small plunger with a ball cup turned at the bottom, and between the cup and the bottom of the wheel spindle a small spring is fitted.

It does happen, of course, that an accumulation of steam in the steamchest will find the large surface of the valve and clap it to the port face—but not always.

To test the slide valves when the engine is cold, I take out the milled wheel spindle and leave the plunger, spring, and ball in place. If the engine is turned slowly, these small fittings will be lifted, but if it is turned quickly and the slide valve is working properly, these fittings will shoot out altogether.

I suppose air escaping from the ordinary cocks might give the same result, but I feel sure it could not be so positive. Further expressing this point, I would say, that if there is a possibility of the slide-valve canting in the way suggested, the engine will not work under steam, and further-

(*Continued on page* 41)

*The Allchin "M.E." Traction Engine

to $1\frac{1}{2}$-in. Scale

by W. J. Hughes

HAVING drilled all the holes in the hornplates, and filed the bearing slots and holes out, the plates may be separated. The screws and nuts having been removed, the heads of the rivets are filed off, and the rivets punched out.

The holes marked "R" on the drawing of the right-hand hornplate may now be set out and drilled. First, there are two holes for the draincock brackets, which are drilled No. 51 and tapped 8 B.A. Then near the front are two holes for the footboard bracket, which are drilled No. 48 and tapped 7 B.A. Behind the hole for the third shaft bracket are three No. 40 holes for the pump platform, which is an extension of the bracket itself.

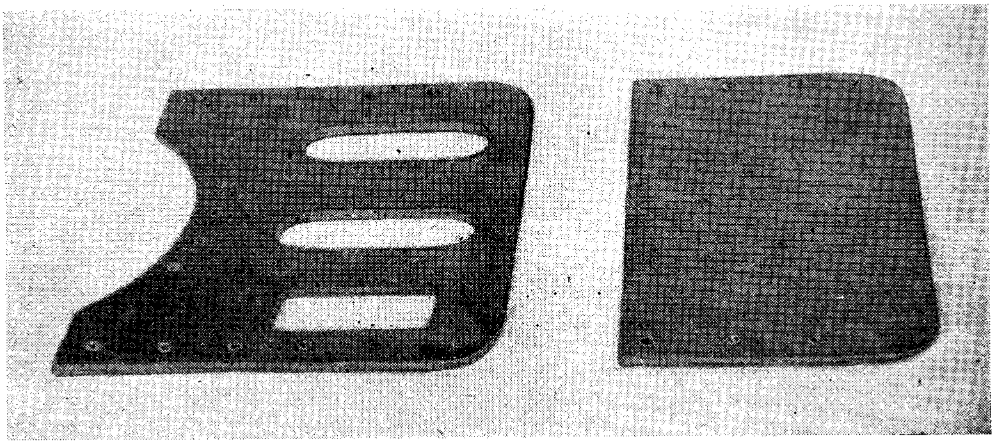
Two holes near the top edge at the rear are drilled No. 50 to clear the 10-B.A. screws which will hold the lubricator and gear-guard in place. Incidentally, I omitted to mark these "R" on the drawing, and must apologise for the omission. If anyone has drilled them through the left-hand plate as well, they may be countersunk slightly on both sides, and plugged with a scrap of iron wire lightly riveted over at each side. When filed off flush, they will never be noticed, especially after painting.

Finally, there are two $\frac{3}{8}$-in. holes for the injector feed and the blowdown cock respectively.

On the left-hand hornplate there are ten holes marked "L," but two of them, which hold the bracket for the steerage shaft, are not drilled at this stage.

Three holes for the tool-tray are drilled No. 50. A single hole—No. 40—is drilled for the upper rear corner of the third shaft bracket, and near it is another No. 40 hole for one of the bolts which holds the tender in place. A No. 51 hole is tapped 8 B.A. for the damper-rod bracket, and finally two holes are drilled No. 55 and tapped 10-B.A. for the gear-case brackets.

The spectacle-plate is cut from 14-g. mild-steel, and should be as flat as possible before filing to size, $3\frac{13}{16}$ in. $\times$ $2\frac{3}{4}$ in.



Photograph No. 9. The spectacle plate and front plate before fitting the angles

When the plate has been squared up, it is easier to set out the various holes before rounding the corners and hollowing the bottom edge to clear the boiler; but I do not think this needs detailing, as it is quite straightforward. However, the outlines of the three slots should be lightly centre-popped at intervals, as already described for the outlines of the hornplates.

The two round-ended slots for the connecting-rod and eccentric-rods may be drilled out. In the centre of the centre-line of the slot, and $\frac{1}{4}$ in. from each end of it, drill $\frac{1}{8}$-in. holes, taking care to get them accurately centred. Enlarge them to $\frac{1}{4}$ in. diameter, and then to $\frac{3}{8}$ in. Now change the drill to $\frac{1}{2}$ in., and enlarge the two end-holes first, following with the centre-hole, which will break into the other two. However—and this is important!—if the pilot-holes are *not* truly centred, the $\frac{1}{2}$-in. holes would run over the line, and it will be necessary to use finally a drill *smaller* than $\frac{1}{2}$ in., finishing to the line with a round file. The slots may then be finished by filing.

For the rectangular slot, through which the

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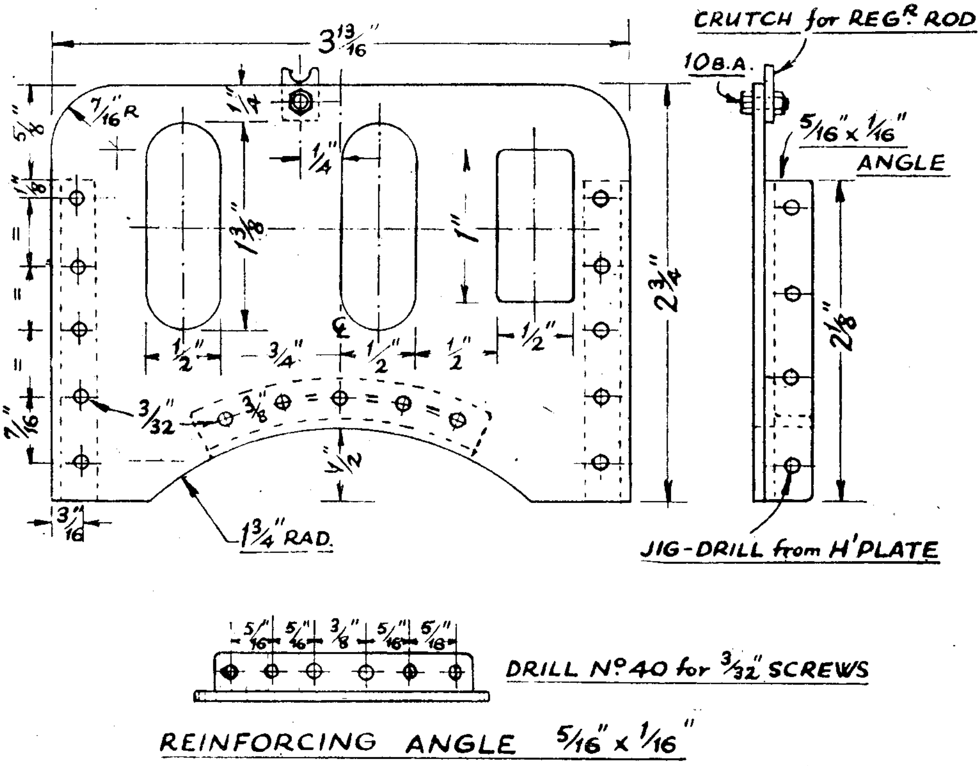
*Continued from page 762, Vol. 106, June 12 1952.

governor-belt passes, first of all mark centres $\frac{1}{16}$ in. inside each corner, and drill $\frac{1}{8}$-in. holes here, which will give the correctly rounded corners to the slot. Two side-by-side $\frac{1}{2}$ in. diameter holes will then remove the bulk of the waste, but again drill the successive $\frac{1}{8}$ in., $\frac{1}{4}$ in., and $\frac{3}{8}$-in. pilot-holes first. Finish by filing to the lines.

The holes for the rivets should be drilled rather long—say, 3-in. or so—for easier holding. It can be bent cold, but you may find it easier to bend it red-hot. In either case, the material is placed on a suitable mandril, and most of the hammer blows—not too hard, please!—will be required on the edge of the vertical web.

Alternatively, the angle may be *turned* to shape from the solid. Clamp securely a piece of $\frac{5}{8}$-in. $\times$ $\frac{5}{16}$-in. or $\frac{3}{8}$-in. steel to the faceplate,



Setting out of the spectacle plate and angles

3/32 in. diameter, and that for the crutch for the regulator-rod No. 50.

To hollow the bottom edge of the plate, the waste may be removed with a fret-saw or tension file, or by drilling a row of holes. Personally, I merely used a large and coarse half-round file (and some energy), and the job was done in a few minutes. Rounding the upper corners is a simple filing job, too.

The Angles

The angles which are riveted to the hornplate are $\frac{5}{16}$-in. $\times$ $\frac{1}{16}$-in. *steel*—not brass!—and if this size is not available, it will have to be milled from larger angle or from the solid bar. Different methods were described in the Allchin article on April 17th, 1952, you will recall. While you are at it, five pieces will be needed, including the curved bottom piece and those for the front plate.

The piece to be curved had better be cut with its lower edge 1 17/32 in. from the centre. The piece will need to be $2\frac{3}{4}$ in. to 3 in. long, and of course, the clamps must be so positioned that they clear the tool. A packing-piece will be needed between the work and the faceplate. The inside curve of the angle may then be turned with a boring tool, and the outside with a parting-tool, using light cuts and plenty of lubricant.

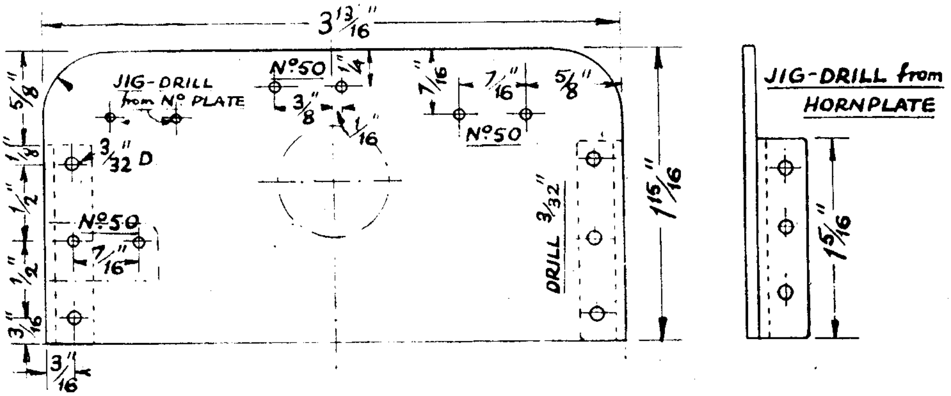
Another alternative would be to bend a piece of the larger angle to approximate shape, and to turn that down. But it would have to be bent at red heat!

The Front Plate

The *front* plate, curiously enough, is that which comes nearest to the back of the traction-engine, but the explanation is simple enough. The name dates back to the days of the portable engine (from which the traction-engine was developed). Quite naturally the part facing the driver was

the front; that part of the boiler which most model engineers call the *back*head is, to most old engine-men, the firebox front. And so, in the traction-engine, the plate which faces him becomes the *front* plate. Similarly, the front cover of the cylinder is that which faces the driver, and not that which faces which way the engine travels! wrong! They should be on the *inside* of the plates; that is, if you put the plates face up on the bench as drawn, the angles go on the side underneath.

It will be easier to fit the curved angle before fitting the others. Clamp it in place with a couple of tool-maker's clamps, making sure that



Setting out of the front plate

After flattening the plate, set it out and file to size, but do not round the upper corners until all the holes have been set out and drilled.

This operation need not be detailed here, but do note that where the angle fits at the left-hand side, the central hole is *not* drilled 3/32 in. diameter to take a rivet, but No. 50 to clear 10 B.A. This is because the tool-tray is bolted on here.

The two holes for the number-plate (engine-number, not registration number!) should be left at this stage, as castings for this are not yet available. The $\frac{3}{4}$ in. diameter circle shown in chain-line is where the pressure-gauge fits, and if you possess one of this diameter you can cut it away by the "ring-of-holes" method, making the finished hole a nice push fit for the gauge.

Riveting the Angles

The angles may now be riveted to the plates, using 3/32-in. iron round-headed rivets, and making sure that you get them on the correct side of the plates—it's easy enough to get them the edge is level with the curved edge of the plate, and that it is central. Drill the middle hole, insert the rivet, and rivet it over. Check again to see that the angle hasn't moved—it shouldn't have, but it is as well to check everything!—and drill the next two holes. After inserting and heading these rivets, remove the clamps, and drill and rivet the two outer positions.

The straight angles are fitted similarly, of course, but here, besides watching that the angle is flush with the edge of the plate, take care that its upper end is exactly $\frac{5}{8}$ in. from the top of the plate. A simple precaution, but it will render the task of assembly appreciably easier, when we fit the spectacle- and front-plates to the horn-plates.

Which reminds me to warn you not to do that at this stage; there is a strong temptation to do so, but it should be resisted manfully. It will be much easier when we have machined up the bearing-brackets and the third and fourth shafts, and the bearings will be the next operation.

(*To be continued*)

The "Warrior" Mark 2 Engine

(*Continued from page 38*)

more the fittings mentioned above will not move when the engine is cold.

My advice to anyone who would like to make this engine is:—Don't let the 2-throw crankshaft deter you. To make this out of a bar of steel $6\frac{1}{2}$ in. × $1\frac{1}{4}$ in. is quite an experience, and not so difficult as all that. As a matter of fact, I found the lining up of the engine on the bedplate the most difficult. But even this job gives real pleasure, because you realise you are making something worth while, and the virtue of patience is yours because of it. Mark everything as it is completed, not with a pencil or a piece of chalk, *paint it on*, such as No. 1 Column, No. 1 Cylinder, No. 1 Cover and so on. It takes a little time to complete this engine—I was at it $4\frac{1}{2}$ months.

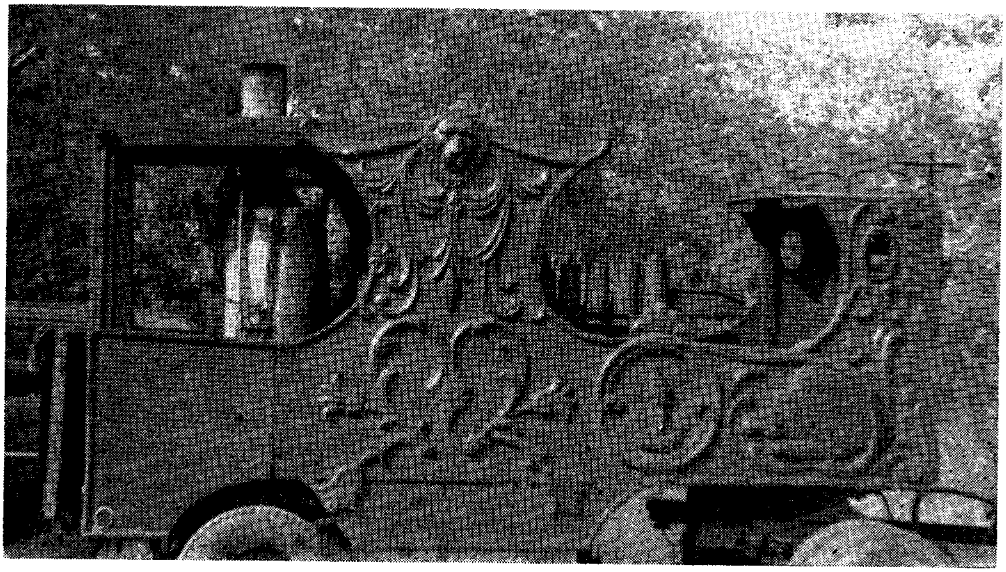
In conclusion, I wish to thank Mr. Westbury for his splendid articles published in THE MODEL ENGINEER, "Utility Steam Engines," which has been a great help to me, and I might say a blessing to all steam fans. Also, to Mr. Gansell of the Imperio Co. who supplied the castings, and for his friendly advice during the construction of the engine.

THE STEAM CALLIOPE

by I. Treadway (Bristol, Connecticut, U.S.A.)

IN view of the interest which has been expressed lately on the subject of steam organs, and as a follow-up of my letter which appeared in the June 12th issue, the following information regarding the steam calliope, which I have seen recently at a circus, may be of interest to many readers.

the extreme rear is a step for the fireman, next a coal bunker, then the boiler followed by the pipes. In front of the pipes is the console and lastly the water tank on which the organist sits. The sketch will show this layout. I would estimate the coal bunker held 300 lb. and the water tank about 200 U.S. gallons.



A side view of the travelling calliope

First, a brief history. The operator of this device said it was built *circa* 1900 by Tangley, of Buffalo, N.Y. However, the console bears a nameplate giving the maker as the Thos. J. Nichol Co., of Grand Rapids, Mich. It may be that Tangley built the wagon and installed the Nichol calliope in it, but I'm not up enough on circus equipment to know if this really might be the case. It was originally owned by P. T. Barnum. Since then it has been with several shows including Gentry & Cole Bros. and just this year was resurrected by King Bros. & Christiani for use in their show.

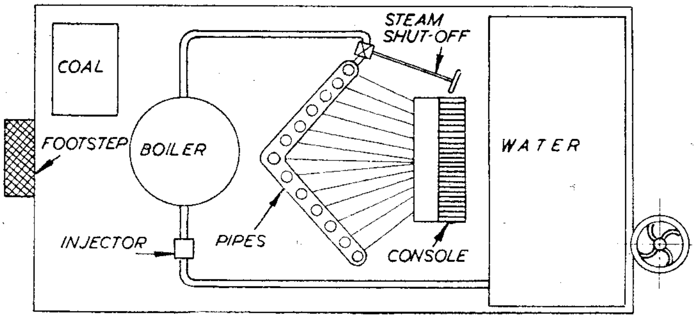
The unit was originally mounted in a conventional horse-drawn circus wagon but has now been fitted with a truck rear axle and pneumatic tyres, the front end being hooked to a tractor unit to make a semi-trailer of the rig. It was interesting to see the original hand brake wheel still in one place, however. The sides show the usual carvings of clown heads, lion heads and scroll work typical of a circus wagon, although the gilt work is badly dulled and did not show so well as it might.

Briefly, the wagon is laid out as follows :—at

The boiler is a vertical fire-tube pattern about 24 in. diameter. Material is steel. The engineer on the job thought it had 22 tubes. Inside diameter of the firebox is about 18 in. and is fitted with shaking grates. Boiler fittings consist of a water glass (no water column), two try-cocks, injector, pressure gauge, and safety-valve. Neither a blow down nor blower were seen but they may be present. Boiler is lagged with asbestos, and soft coal is used for fuel.

The safety-valve blows off at 110 lb. and the playing range varies from 60 lb. to 90 lb. Best operating pressure is 80 lb. the keys being hard to depress at 90 lb. and over. Below 40 lb. the injector does not pick up, and if the water is low and the pressure down, it is necessary to drop the fire. There is no auxiliary boiler feed device, apparently. I could get no definite answer on steam consumption but the operator assured me it would play for quite a while before the pressure dropped too far.

The calliope section of this unit is most interesting. It consists of 32 pipes which are actually chime whistles. Each of these pipes is arranged on a common V-shaped manifold.



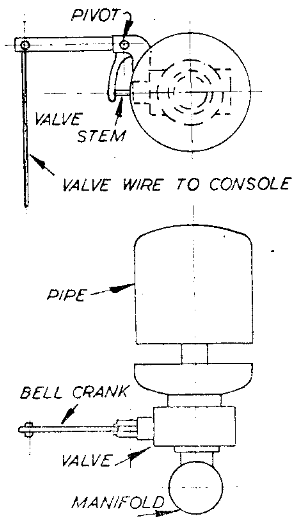
Rough plan sketch of the steam calliope

The valves controlling the pipes I could not get data on, but they may be similar to the usual whistle valve with which I am not at all familiar. The tonal range covers roughly $2\frac{1}{2}$ octaves from C-C-C-G. The console keys appear to be made of solid brass and are connected to the pipe valves through linkage and wires. See sketch of how this is arranged.

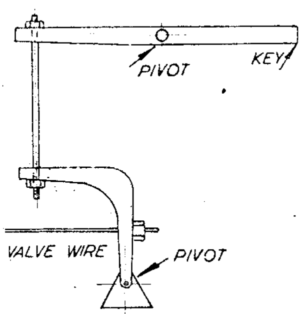
A shut-off valve controls the steam to the manifold and is located just to the operator's right of the console. Each pipe, of course, carries its own valve, this valve being actuated by the valve wire from the console. A bell crank at the valve transfers the motion to depress the valve stem and thus sound that particular pipe. There are numerous points of adjustment throughout the console and valve linkage and each pipe has a tuning-rod extending through its top for pitch adjustment.

It is rather difficult to describe the tone of this calliope. I did not hear it close to, but others tell me it is very shrill. I did hear it from

(*Continued on page* 45)



Plan and elevation, showing the valve operation



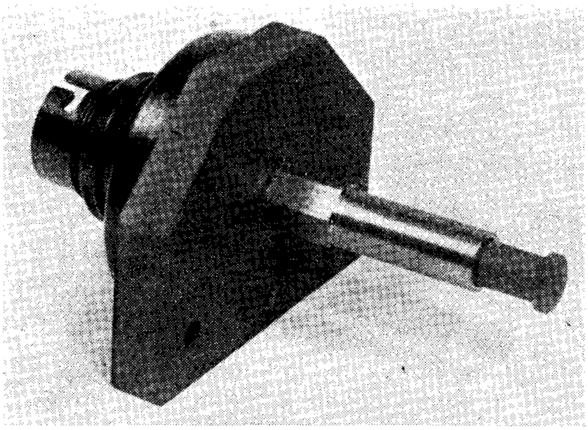
Linkage in the console (elevation)

The fireman's end of the calliope

AN AUTOMATIC DOOR SWITCH

by "Artificer"

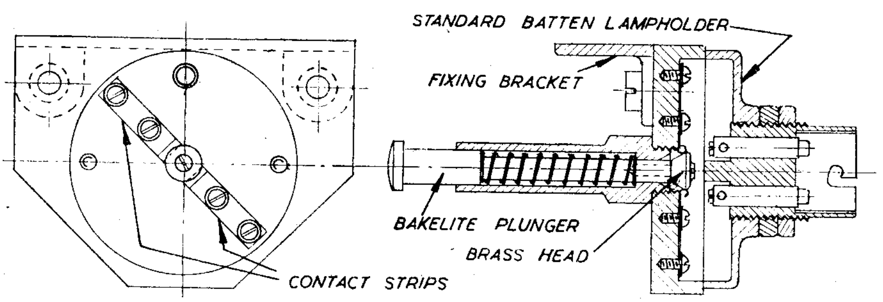
MOST readers are familiar with the type of switch designed to operate by the opening or closing of a door; such devices have been used extensively for various purposes, including the control of lights and burglar alarms, but ready-made fittings of this nature do not seem to be readily available. I recently built a domestic refrigerator from components supplied by Messrs. Braid Bros., and wished to equip it with the usual interior light to switch on when the door is opened. They offered to obtain for me a very neat fitting of Continental manufacture, incorporating an Edison screw lampholder and a cut-out switch, but in view of the possible difficulty of obtaining lamps to suit this fitting, I decided to construct a somewhat similar device incorporating the British standard bayonet holder.



The complete switch, with lampholder attached

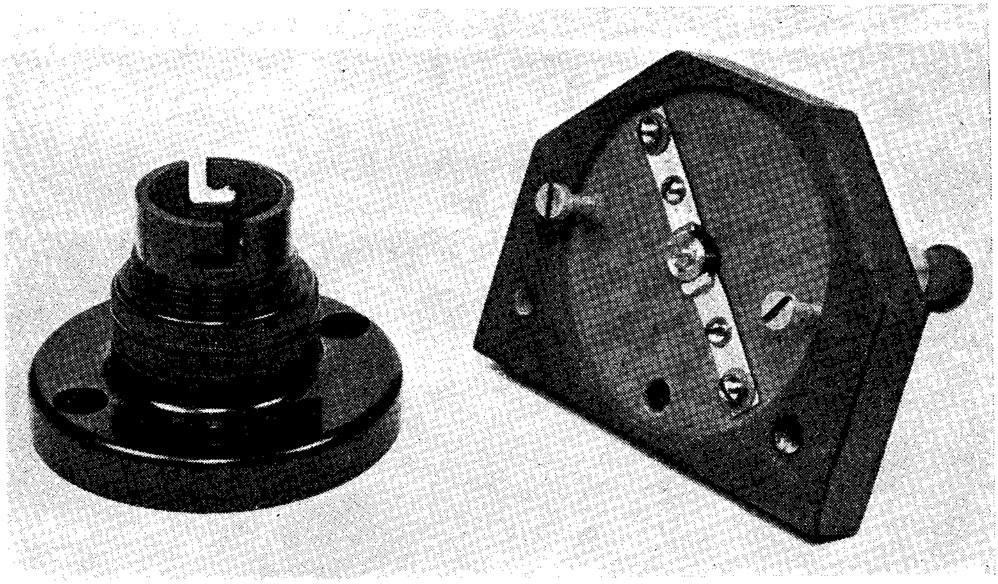
This is arranged for fixing inside the roof of the cabinet, in such a position that the plunger is slightly displaced by the door at the instant it is completely closed. The main component is made from a piece of laminated bakelite board $\frac{1}{2}$ in. thick, which is recessed on one side, and drilled and tapped through the centre to take the plunger barrel. This could be made of hardwood with fairly satisfactory results, but the insulating properties of such material might be doubtful in a humid atmosphere. A standard bakelite batten lampholder is attached to the recessed side of the plate by two 4-B.A. screws, and a hole is drilled in the plate for the supply leads to pass through.

The contact strips, attached inside the recess, are made from brass shim stock, 0.015 in. thick by $\frac{1}{4}$ in. wide, hardened by burnishing, and rolled into a $\frac{1}{16}$ in. eye at one end by bending round a thin wire with pliers. The 6-B.A. screws which fix the strips should not pass right through the bakelite, as "live" conductors on exposed surfaces must be avoided. The reason why the strips are disposed at an angle of 45 deg. across the diameter of the recess, as shown, is in order to avoid any risk of proximity to other metal parts in the lampholder or its fixing screws; note that in the sectional view these strips are shown in the vertical position to illustrate the method of fixing.



General arrangement of switch

The plunger barrel is turned from hexagonal brass bar; as an alternative to screwing in, it could be furnished with a flange and fixed with screws. In either case, the screwed end or locating spigot should be shorter than the thickness of the insulating material at this point. The plunger is turned from bakelite, and drilled and tapped 6 B.A. at the end to fix the conical brass head, which may either be drilled to take a screw, or made with an integral screwed end. A fairly strong spring should be fitted to the plunger, to ensure a firm contact when the switch is on.



Lampholder detached to show switch contacts

Only about $\frac{1}{16}$ in. movement of the plunger is necessary to break contact, and owing to the elasticity of the rolled ends of the strips, there is a slight wiping action which ensures that contact is not impaired by dirt or tarnish.

It is important that there must be no risk of the plunger coming in contact with the terminals of the lampholder when pushed in. Most holders of this type have a partition of insulating material between the terminals, which prevents this, but if not, it would be quite easy to fit a fibre or paxolin disc between the base of the holder and the mounting plate. Some adjustment of the plunger movement may be provided by slotting the holes in the bracket which secures the fitting to the roof or wall of the cabinet ; or if desired, an adjustable " tappet " may be fitted to the end of the plunger. In some cases it may be desirable to make the switch entirely separate from the lampholder, so that the latter can be fitted elsewhere than near the door.

Wiring is very simple ; one of the supply leads is taken to one of the strips, and the other to one lampholder terminal, a short piece of insulated wire inside the recess being used to connect the other strip with the second lampholder terminal. When fitting the switch, it may not be easy to ensure that the break actually does take place when the door closes ; this could be verified by breaking one of the external leads and tapping in a continuity meter, but a simpler method, if a radio set is available in the near vicinity, is to listen for the slight " click " which denotes the breaking of the contacts.

While this is quite a trifling little gadget, for which no originality is claimed, it has proved entirely satisfactory in use, and is offered in the hope that it may be useful to other readers. Its use, of course, is not by any means confined to refrigerator cabinets ; it may equally well be applied to larders or store cupboards in dark places where, if a light is fitted, one may waste time fumbling for the switch, or alternatively, waste current by forgetting to turn it off. By a slight modification of the contacts, they may be arranged to work in reverse, so as to switch the light *on* as the door is closed ; as, for instance, in a lift or telephone box.

THE STEAM CALLIOPE

(*Continued from page* 43)

half a mile away and at that distance the tone sounds quite pure and a little mournful. It lacks the " dryness " of tone of an air calliope. Once heard, this sound is not easily forgotten.

This has been a rather sketchy description of this machine and it is hoped that other subscribers in this country (U.S.A.) can intercept this circus in its travels and pick up some of the details I have missed. In any case this will answer your reader's query to the effect that there is at least one steam organ still extant and in operating condition.

*A Simple Photographic Rangefinder

by R. F. Stock

THE layout of the mechanism as designed for one of my own cameras is shown in Fig. 7; the tip of the dural lever is provided with a small steel ball to minimise wear, and the spiral compression spring eliminates backlash throughout the system. **M1**, cut with a wheel cutter and ground smooth on its edges on an oilstone, measures $\frac{3}{4}$ in. $\times \frac{3}{16}$ in. and is $\frac{1}{8}$ in. thick.

to blend with the camera profile. Fig. 7 is a cross section through the casing on the centre-line of the apertures; it will be seen that the cover steps down to a lower plane on the right and this is merely to enclose some other mechanism unconnected with the rangefinder.

The secondary and viewing apertures are closed by thin squares of plane glass (cut from cover

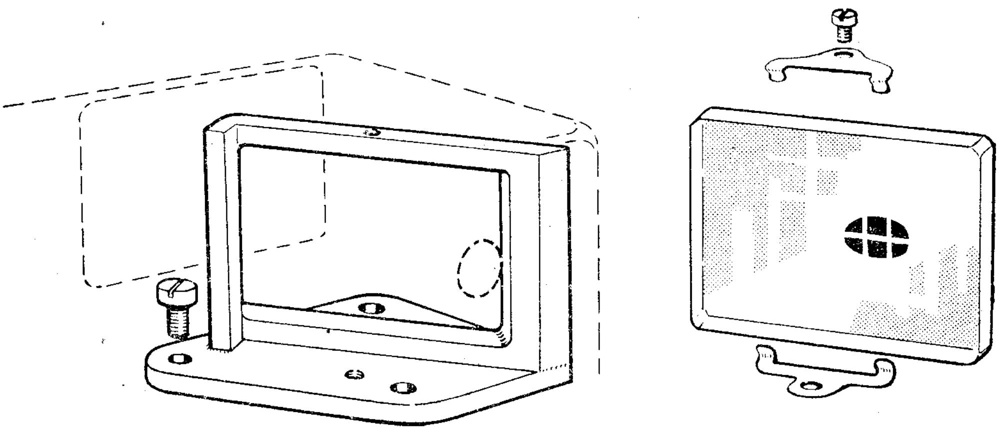


Fig. 6

The support for **M2** is fabricated from hard brass sheet, and the shape is shown in Figs. 6 and 7. It consists of an open supporting frame soldered to a baseplate, and the aperture in it is large enough to be just outside the limits of the field of view—for which purpose the opening is filed through diagonally as shown by the dotted line in Fig. 7.

The small mirror is made quite simply by removing the silvering from the back of a larger piece of mirror except over the central elliptical portion (shown black in Fig. 6). A sharp razor-blade held obliquely to the surface was used to scrape away backing and silver, and the actual mirror-spot left was finally trimmed to size by trial and error as described later.

The mirror is retained against the open frame by two bronze springs as mentioned for **M1** and is not adjustable. The angle (not quite 45°) was found by experiment and the holding down bolts tightened after final adjustment.

Case

The casing over the mechanism is made as a separate unit in order to prevent an accidental knock upsetting the mirror adjustments. It is made from thin sheet brass, of a suitable shape

*Continued from page 12, " M.E.," July 3, 1952.

glasses) and are retained in the manner shown by Fig. 8. A brass clip is sweated to the inside of the case, and both are drilled to the appropriate size for the aperture. The edges of the clip are then turned over channel-form, and the glasses slid into position. The final operation on the cover is to paint the interior with a matt black paint, and this creeps under the glasses as far as—but no farther than—the edges of the hole (by capillary action) thus holding the glasses firmly and preventing the ingress of moisture and dust. The cover is held to the camera body by four screws in convenient positions.

The glass cover over **P** is made from a pale yellow photographic filter, but a piece of truly plane perspex might be adequate if unscratched, and tinted to a suitable colour. It is retained by clips in the same way as the glasses at **S** and **V**.

If the otherwise wasted space in the body of the cover is to be utilised for a separate view-finder, Fig. 7 shows the method. The finder is a simple optical combination of positive and negative lenses and approximates to a telescope used the wrong way round.

The two lenses should be selected by trial and error, until, when spaced the correct distance apart, they present a clear, reduced picture of the view. Any available lenses may be experimented with and when a suitable pair are found,

may be cut down to size with a wheel cutter, being trimmed afterwards on an oilstone.

The exact field of view is determined by the size of the front rectangular aperture, and adjusted with reference to the picture on a ground glass screen in the focal plane. Both lenses are retained by clips as described above.

Fig. 7 shows a diaphragm either side of the viewfinder, pierced by holes to permit the rays from **M1** to pass. If a viewfinder is not fitted, a diaphragm is still required between **M1** and **M2**. The aperture should be cut by trial and error in a cardboard diaphragm, and adjusted in size until it is just large enough to frame the image of **S** ; the shape may then be transferred to thin brass which is soldered into position.

Coupling

The coupling system must be a mechanical linkage which moves **M1** through a small angle as the lens is racked back and forth. Neither the movement at the tip of the rangefinder operating lever (**A**, Fig. 7), nor the movement of the lens panel is linearly proportionate to distance, but over the distances involved it is sufficiently accurate to link these two functions by a simple mechanical lever. This member, **B** in Fig. 7, is pivoted to the fixed part of the camera body on a pin at **C**, and having unequal arms provides the necessary step down in movement. A compression spring **D** keeps **A** firmly against **B**, and **B** in turn is pressed against **E**, an operating peg on the moving lens panel or barrel.

The details of this arrangement must obviously depend upon the construction of the camera. In this case the slide of the lens panel was adjacent to the rangefinder so that **E** could be bolted directly to the moving part. In other cameras it would be necessary to provide a link between **E** and the moving part.

In any case **E** must move fore and aft exactly in step with the lens and thus transfer its movement directly to the long arm of **B**. It is important that the two operating faces of **B** are truly radial, and that the short radial face when projected should pass through **M1** pivot at the mid-point of travel. This can be seen in Fig. 7.

To prevent misalignment through wear, lever **B** should be hard, and it was in this case made

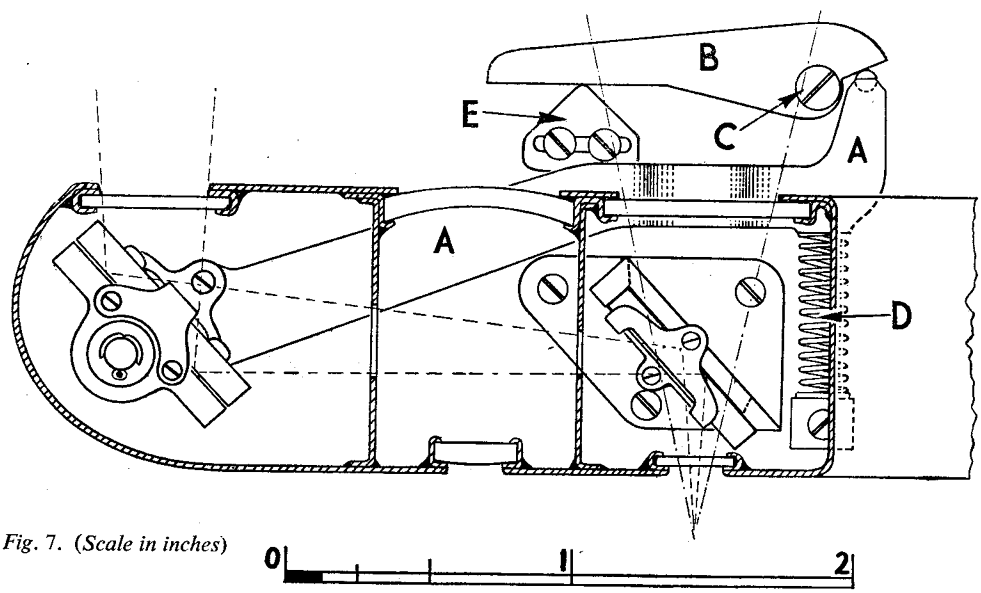


Fig. 7. (Scale in inches)

from a scrap of cast-iron. Pivot **C** was a steel pin screwed (up to a shoulder) into the camera body.

The operating peg **E** is a roughly triangular block of steel bolted through a slot to the lens slide ; it can be adjusted in a transverse direction to vary the ratio of movement between the lens and **A**.

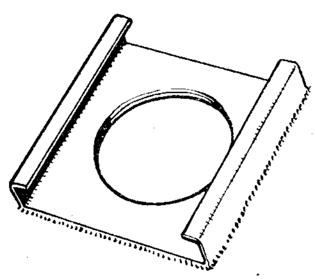


Fig. 8

Adjustment

The adjustment of the rangefinder was carried out against visual focussing on a ground glass screen temporarily fitted in the focal plane by adhesive tape.

The lens was first set at " infinity " by focussing sharply and carefully on a T.V. aerial at about 400 yards distance, using a magnifying glass to

view the image. To obtain critical focussing, the glass should be ground very finely, and rubbed over with a very thin film of petroleum jelly.

The images in the range finder were then examined and brought into coincidence both vertically and horizontally by adjustment of **M1** levelling screws.

The camera was then set to a near object, at a few feet, and the rangefinder images observed, to determine whether the secondary image had moved insufficiently towards coincidence or beyond it ; the appropriate correction could then be applied to the position of **E**, moving it towards **C** in the former case and vice versa.

The camera was then set to infinity again and **M1** adjusted for coincidence. Another check at close range enabled the effect of the previous correction to be determined and the above procedure was repeated several times until coincidence at both infinity and close range was obtained.

A series of checks at intermediate ranges should show that the two units are moving in step, but under certain conditions it might be found that accurate coincidence at all distances is impossible to attain. If the error is noticeable a slight correction can be applied at the point(s) noted, by filing the long arm of **B** at one or more places (very cautiously) so that **B** has in fact a slightly non-linear cam action.

When the rangefinder is fully adjusted all bolt heads should be locked with shellac to preserve the settings.

The above procedure has been included for convenience with the details of the coupling mechanism, but after constructing the rangefinder proper some lining-up was required before final adjustment.

All the rangefinder parts except **B** and **M2** were completed and assembled. The centre of the mirror spot on **M2** could then be found by measurement as it lies on the axis of **V** and **P**. The silver was scraped away from a piece of mirror measuring 2/3 × $\frac{3}{8}$ in. except for a circle $\frac{1}{4}$ in. diameter around the centre mentioned above.

M2 was then slipped into position and inspection showed a dark fringe around the secondary image ; the position and size of the fringe indicated where the silver should be further removed, and this process was repeated until the spot was reduced to its correct size, shape and position. At this stage the spot should be appreciable only as a dark blur in the centre of the primary image, when **S** is covered over ; if it conceals some portion of the primary image it may be scratched through in several places as shown in Fig. 6 to reduce its density, and this method should be used to balance the intensity of the two images. Before finally reducing to size, when the spot is small enough to show the limits of **P** around it, the angle of **M2** holder may be adjusted so that the secondary image is centred in the primary.

The angle of **M2** should not then be altered unless it is found that vertical coincidence is impossible at varying ranges, in which case **M2** is not vertical and must be adjusted in this plane.

When **M2** is completed the rangefinder may be operated manually by moving the tip of lever **A**. The movement required at this point can then be measured (between infinity and minimum range) and this figure enables the rough proportions of **B** to be calculated and peg **E** to be fixed.

The diaphragm may then be fitted and the coupling adjustments made as detailed above.

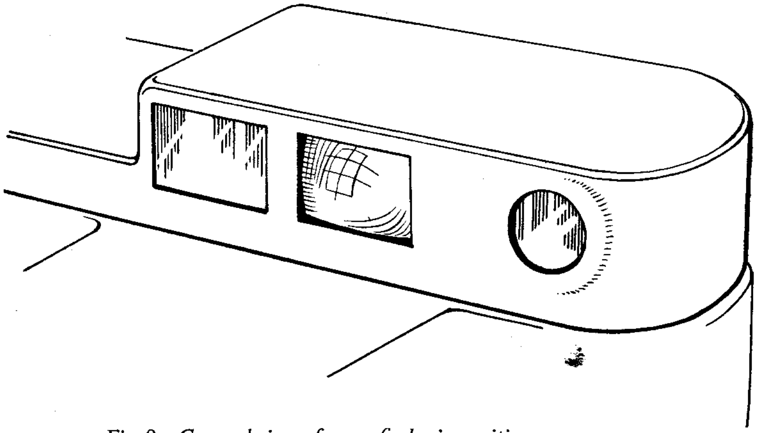


Fig. 9. General view of rangefinder in position on camera

Conclusion

As with many subjects, the above procedure sounds a good deal more complicated than the process really is, and in fact the unit described is simple to make and occupies only a little time.

As fitted to my own camera, I find it easy to focus between infinity and 100 ft., or between 10 and 11 ft.—distinctions which I never observed when using " guesstimation."

Anyone contemplating making a rangefinder on these lines would do well to construct a simple " mock-up " in cardboard first, to get an idea of the type of view presented and assess its usefulness.

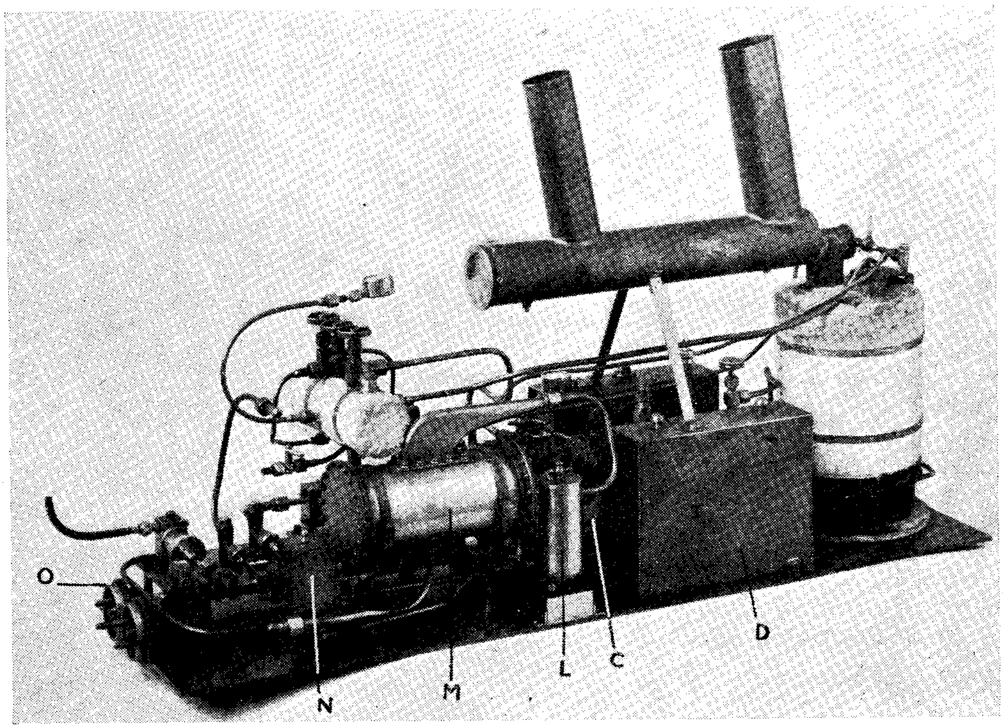
*A Model Steam Plant

for a Coal-Fired Steamer

by Victor B. Harrison

AT this point, I should perhaps explain that the system of Mr. Rogers is that you pump up air pressure at which you want to run, in your water/air pressure tank, and therefore on the tank is a pressure gauge. On the steam drum receiver, is another pressure gauge. Therefore when you turn on the water to the boiler, the two gauges should show the same pressure. So they do the induced draught from the other boiler. My son and I were delighted to see that the exhaust was just right to keep the fire going.

We noticed that the little engine was slowing up, and discovered that pressure had dropped very low in the pressure tank. This was put right by a few strokes of a foot pump. I then opened the throttle to the main engines. They too were



"C"—Pressure water tank; "D"—Water tanks for feeding pressure tank; "L"—Oil separator; "M"—Condenser; "N"—Mechanical oil pump lubricator; "O"—Geared flywheels of main engine

when you have turned on the water before you open any of the steam valves. So if the pressure in the pressure tank drops, so does the pressure in the steam drum. This started trouble No. 1.

For the test, steam had been raised in the boiler by my auxiliary boiler, and when the fire was burning brightly, steam was turned on to the circulating pump plant. Away it went perfectly. The exhaust from that plant is turned into the funnel, and as soon as it was running, I stopped

*Continued from page 5 "M.E." July 3, 1952.

soon running well. I put some more fuel on the fire and, to my horror, the engines all began to slow up. My son spotted that, once again, the pressure had dropped in the pressure tank. A few strokes of the pump put matters right. It did the same trick again, but as the little S.T. engine ran slower and slower, so the induced draught on the boiler became less, and so the fire went down, and the finale of the test was a flooded boiler and steam drum. And that was that! It was decided to remove the pressure tank, and test for air leaks.

I pumped up pressure in the tank, and immersed it in a wash-basin full of water. There appeared a beautiful string of bubbles from the check-valve. With a D-bit, I made a new seat, and gave the ball a nice tap. It was O.K. as long as the ball remained on its seat, but the moment it was loose again, it did not reseat. Twice more I skimmed off the seat, but with no better results.

I never before had failed to make a check-valve or a pump valve tight. I took the tank, etc., to the works, and showed it to our precision engineer. He was confident he could do it in a few minutes. It took him the whole afternoon, but at last it would hold air for about an hour. He was not satisfied, but I felt it was good enough for my purpose.

Once again, steam was raised. Off went the two engines in fine style, but their speed varied very much. They ran at normal speed for a time; then they would slow up, and then suddenly, they would race away.

When this happened, I noticed the steam gauge pressure was tremendous on the steam drum, and yet pressure remained the same in the pressure tank. Bond's had fitted a check-valve between the pressure tank and the boiler, and I came to the conclusion, that from time to time, more water entered the boiler than was required, and so steam got trapped between that check-valve, and the steam drum. I then removed the ball, and the engine ran at a much more uniform rate.

The next piece of trouble was the mechanical lubricator. To begin with, it worked excellently; but all of a sudden, steam and water got back into the lubricator. I discovered that the ball in the check-valve was not seating properly. I then cleaned out the whole system, and refaced the port faces on the pump. On the next test, all seemed well, but after about a quarter of an hour, the same thing happened again. Once more I went through the whole performance, with exactly the same result. Finally, I gave up the job, and took the whole contraption to Mr. Layton. He thoroughly examined the check-valve, and reseated it, and on the test we did there, it seemed perfect. Once more, steam was got up, and at long last the plant was running perfectly.

When the water tanks were empty, I shut down, and a few days later, I again raised steam; everything functioned perfectly.

That same evening I once more raised steam, but this time, "third time was unlucky." All of a sudden, the plant stopped. The pressure gauge on the steam drum had dropped to zero, whilst the gauge on the pressure tank showed about 50 lb. I opened up the water valve on the tank, but nothing happened. The fire seemed perfect in the boiler, so frankly I could not think what could be wrong. First of all, I disconnected the steam pipe from the steam drum, in case that had failed, but on doing so, no steam seemed to come from the boiler. I then screwed down the water valve on the pressure tank, and disconnected the steam pipe from the boiler. When I turned on the water again, instead of there being a rush of steam, there was only just a wisp coming out. Obviously, there was either no water entering the boiler, or the coil in the boiler had got a stoppage.

I left the plant alone for three or four days and then once again started investigating. The feed from the pressure tank was quite O.K., but even with 60 lb. on it, no water passed through the coil in the boiler. I finally came to the conclusion, that the coil had furred up, and that was quite possible, owing to the water constantly being flashed into steam while running.

I was very depressed, as the whole plant seemed such a promising proposition. I put it away in my workshop, and it would have remained there as a monument of something done, but a failure, but for the chance of Mr. Layton asking me when I was going to build a hull for the plant. I told him what had happened, and what I considered the cause. He strongly maintained that the tube could not fur up, but that there must be some other cause. He asked me to bring up the boiler for him to examine. This I did, but with little hopes of his being able to do anything except put in a new coil.

Weeks went by; then one day I received a letter from him to say that he had taken out the coil, broken the joint and found that one half of the coil was O.K.; but the other definitely was blocked, and nothing seemed to move the obstruction. The tube itself was perfectly clean. He dropped the blocked portion of the coil into pickle, and left it for a couple of days, took it out, washed it, and when he blew through it—behold it was quite clear! His diagnosis was that a bit of flux must have got inside the tube, when the two halves of the coil were brazed up, it then became dislodged and so blocked the tube. I took the boiler home and re-installed it. It was nearly eighteen months before I once again took serious interest in the plant; in fact, not until January, 1952.

During the latter part of 1951, I and the chief engineer at our works, discussed the running of our large compound steam engine which generates 500 kW. This engine is run as a non-condensing compound, with 5 lb. back pressure on the exhaust side. This is caused as we use the exhaust steam for heating the factory, and also for various processes. The chief engineer and myself had the idea of running the engine in the summer as a condensing compound, which definitely would increase its efficiency, and to draw steam for our various processes from the receiver.

With that object in view, I got in touch with the makers.

They replied to the effect that what we would gain on the swings, we would more than lose on the roundabouts, as the drawing of steam from the receiver would reduce the efficiency of the L.P. cylinder by at least a third. Also, the valve-gear would have to be altered, when the engine was run with a condenser.

It was these facts that made me once again take a real interest in my little marine plant. What I wanted to know was: what is the difference in valve-setting?

I asked our chief engineer to ask the makers of our engine for the difference in the valve settings. He received a most interesting reply:—

"With a condensing engine there is a greater range of expansion available than for a non-condensing engine, starting with the same steam

conditions. To use this to the best advantage it is necessary to have a comparatively early cut-off on the H.P. stage, and an early exhaust on the L.P. stage to allow of the steam being sucked easily into the condenser . . . On the H.P. valve more steam lap is given in a condensing than on a non-condensing set, but the lead is about the same so the angular advance must be increased to permit the increased lap. The exhaust lap would be much the same with both sets.

"On the L.P. valve less exhaust lap is given on a condensing than on a non-condensing set. Steam lap and lead would be much the same on both sets.

"You will see from all this that the difference between condensing and non-condensing sets is one of degree, and not of kind."

I altered the valve setting in my H.P. cylinder right away and gave the valve more advance, and so got an earlier cut-off. I did not touch the L.P. valve as it had only got a very little advance, if any, and so was getting a fairly late exhaust.

As I had invited Mr. Layton to spend a Saturday with me, I waited until the day came before I made another test. Directly after lunch we got busy raising steam. A good fire was soon going, and when steam was turned on to the circulating pump plant, it ran as well as ever. I then opened the valve to the main engines, and after having cleared themselves of condensate, they ran merrily. We nearly lost the fire once, as the whole plant was a joy to watch running.

We discussed the working of the condenser, and we both came to the conclusion that it was doing its job in a way, as water was being extracted by the wet and dry pump, but there was a great excess of oil in the condensate. Mr. Layton's idea was that the tubes in the condenser must be heavily covered in oil, and so reducing their efficiency. I myself felt that my wet and dry pump was not big enough, and so no vacuum was created.

On Mr. Layton's advice, I constructed an oil separator, and attached it to the exhaust pipe, before it entered the condenser. I cleaned out the condenser with lighter spirit. My word! What a lot of oily muck came out. I had to put in three lots of spirit before the condenser was clean.

As I had had to dismantle a lot of the plant to do all this, I took the opportunity of repacking the glands of the cylinder pistons, and also the valves, of the main engine. The following week-end when I made a further test, I disconnected the "Rogers" boiler, and connected the plant with an ordinary methylated spirit fired boiler. The running pressure was only 25 lb. per sq. in., but that was quite sufficient. The only disadvantage was that a lot of condensate formed in the steam-drum, which had to be drained off first.

The circulating pumps were then set running, and after that steam was turned on to the main engines. The steam being of the wet variety, I not only opened the drain-cocks on the cylinder, but also the one at the bottom of the new oil separator. As soon as the cylinders were clear of water, I closed the cylinder drain cocks and away she went. The engine had been running some time before I remembered that the drain cock on the separator was still open. Not much water seemed to have come out of it, and only occasionally a drop came out. The moment I closed it, the speed of the engine distinctly went up. This phenomenon pleased me immensely, as it proved that there could be no back pressure, but there must actually be a slight vacuum. Further, the condensate being extracted by the wet and dry pump was perfectly clear water with no traces of oil, so the separator was doing its job.

During the week following, Mr. Layton managed to get me the dimensions of a wet and dry pump running at engine speed, on a full-sized engine, and at the same time, giving me the size of the H.P. cylinder. From these facts I worked out the required diameter of my pump by simple proportion. I found I must increase the diameter from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. This should ensure that all the gases and the condensate are removed from the condenser.

I hope before long, to install this, to me, interesting little plant in a suitable hull. It is my intention to arrange matters so that a portion of the deck, etc., can be removed, to allow the plant to be taken out and serviced after a run. This will want some thinking out, as various connections to outside the hull must be able to be easily disconnected. There will be the intake for the circulating pumps, the discharge of the circulating water, the discharge of the condensate from the condenser, and last, but not least, the bilge water.

The next thing that had to be tackled on the plant, was the smoke and soot from the funnel. This was rather unrealistic, as due to the induced draught, smoke coming out was rather like that from a model coal-fired locomotive. Also, soot and miniature cinders were distributed all over the place.

This problem was solved in consultation with my friend, Mr. Layton. The original chimney was removed, and a new one, 1 in. in diameter, fixed with a right-angle elbow. This tube is led into a larger one, $1\frac{1}{2}$ in. in diameter. The inner tube finishes about 1 in. short of the end of the larger tube. This smoke manifold, as I call it, has the same effect as a silencer on a car, as it reduces the speed of the exhaust from the circulating water engine, and now smoke curls out of the two funnels in a most realistic manner.

On the last test run, another snag turned up. If one put sufficient coal on to get some smoke, three times out of five the boiler flooded. In a way, that is not surprising as after all, the coil is only heated on the inside, and will really only work efficiently with a very bright fire.

The coil is about $3\frac{1}{4}$ in. in diameter, and I have decided to insert another 6-8 ft. of coil about $2\frac{1}{2}$ in. in diameter, suspended in the centre of the present coil. This will, I am sure, increase the efficiency of the boiler, and will at the same time, prevent the flooding when stoking up, as the new coil will be suspended in the hot gases and flames. I am sure I will be successful, and have a steamer that really does pour out smoke from its funnels.

If my hopes are realised, and the steamer is a success, I should be very pleased to write a short account of its maiden voyage, with the Editor's kind permission.

A Mandrel-Locking Device
for the Myford M.L.7 Lathe
by "Duplex"

FITTING a detent to engage the bull wheel for locking the mandrel of the Myford M.L.7 lathe does not, at first sight, appear to be an easy matter, for there is no rigid cast-iron wheel guard as in the Drummond type lathe.

However, the box-form headstock casting offers a suitable mounting site, although its upper edge lies somewhat below the bull wheel centre-line. It was decided, therefore, to attach a bracket to the casting, and to adjust the length and angularity of this fitting to bring the spindle of the detent up to the lathe centre-line. Another difficulty was that there was no flat bolting surface available on the outside of the headstock casting, as the raised lettering encroached on the site chosen ; moreover, there was not enough room to allow the bracket to be bolted to the inner side of the casting. It was, however, found possible to fix the detent housing securely with Allen screws by fitting two small distance-pieces to carry the bracket, *A*, clear of the lettering and, at the same time, to align it tangentially to the bull wheel. The threaded bushing, *B*, carrying the detent spindle, *C*, must be accurately machined to abut squarely against its housing when screwed home. The bore is first drilled right through with a letter D drill and then reamed to the finished size with a $\frac{1}{4}$ in. dia. reamer. Next, the bore is opened out with a letter G drill for a distance of $\frac{3}{4}$ in., before being tapped $\frac{5}{16}$ in. B.S.F. The detent spindle, *C*, turned from a length of $\frac{5}{8}$ in. dia. mild-steel or silver-steel rod, is threaded a close working fit in the bushing, and the plain portion is finished to an accurate sliding fit in the reamed bore.

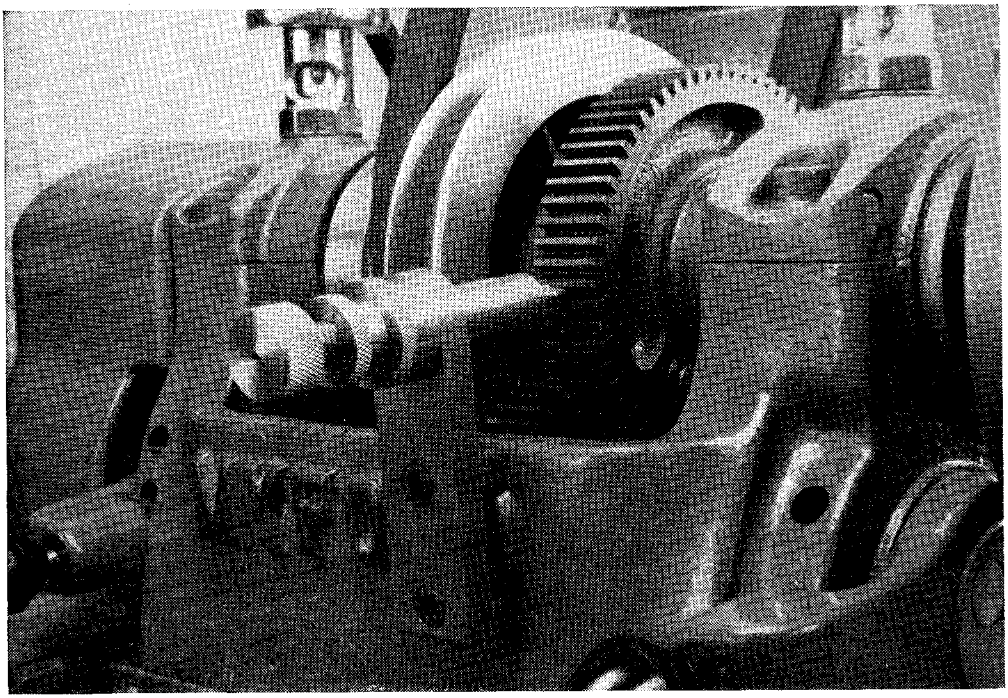


Fig. 1. Showing the bull wheel locked by the detent

Making the Tip

The conical tip of the spindle should be turned to shape by setting over the top-slide, but the final adjustment for forming the tip to fit between the teeth of the bull wheel can be made with the aid of a fine file. The small, knurled locking-collar, *D*, should be made an easy fit on the threaded portion of the spindle, so that

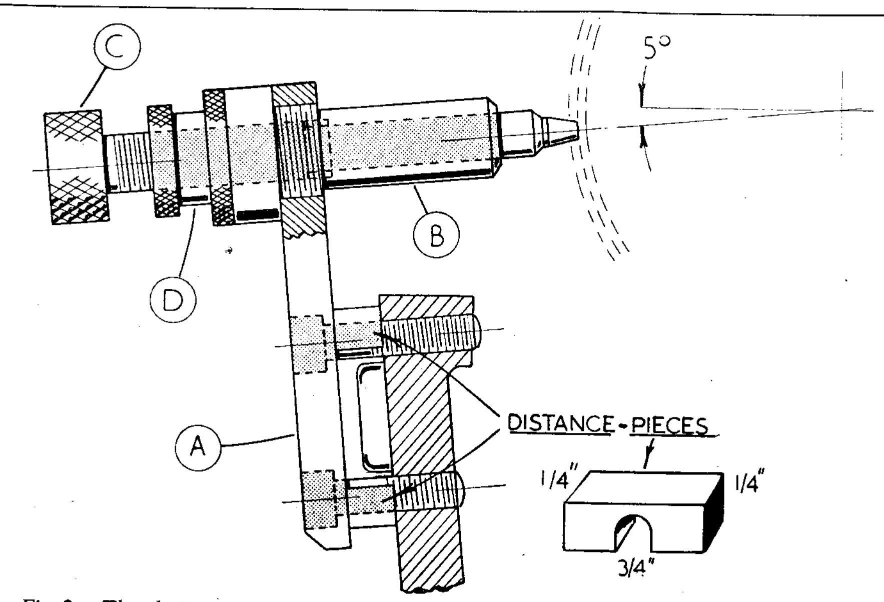


Fig. 2. The device in part-section : "A"—the bracket ; "B"—the threaded bushing ; "C"—the detent spindle ; "D"—locking collar

it can be spun backwards and forwards with the finger to save time when operating the detent.

When fitting the bracket in place, the headstock casting is most easily drilled for the two Allen fixing-screws by using an electric hand-

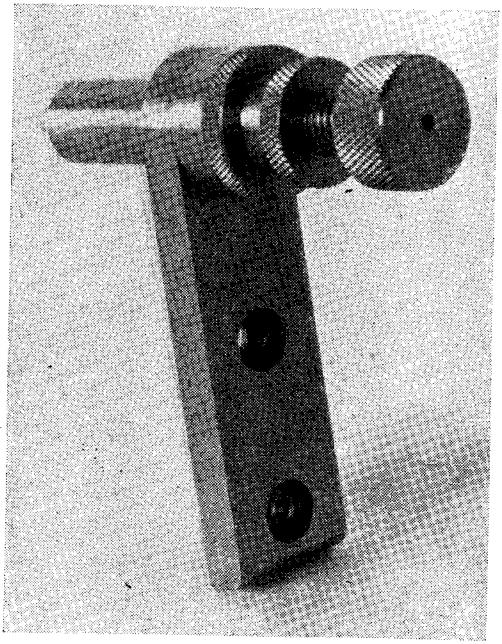


Fig. 3. The attachment seen from the front

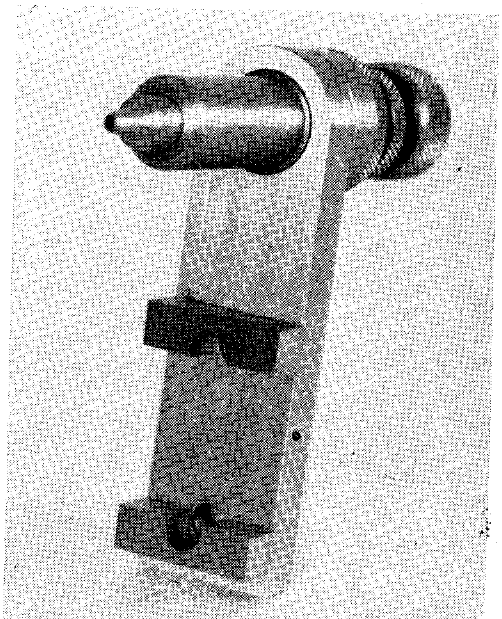


Fig. 4. Showing the distance-pieces in position

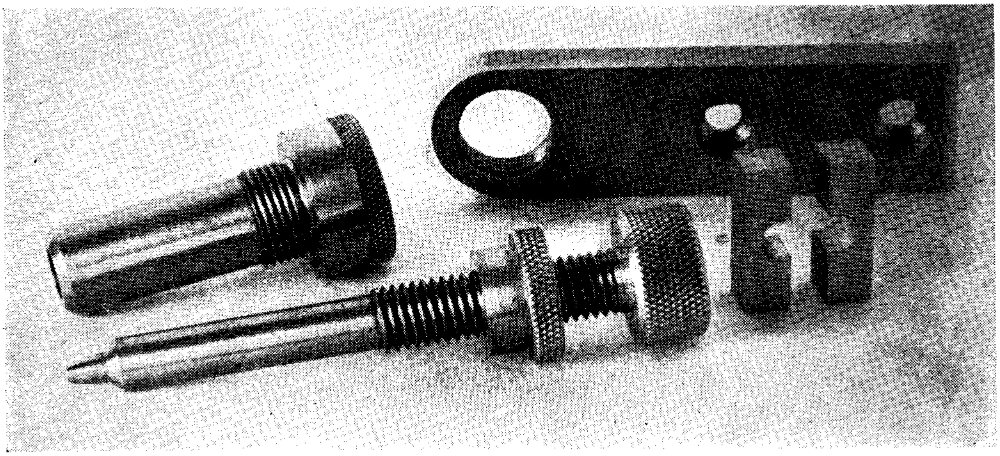


Fig. 5. The attachment dismantled

drill, but it is advisable to pack the casting with rag to enable the drilling chips to be readily removed and kept away from the working parts of the lathe.

The two distance-pieces, are made from $\frac{1}{4}$ in. square mild-steel and are filed to shape to obtain an even bearing. With care, any surface roughness on the headstock casting can be removed with a small cold chisel without defacing the surrounding surface.

The bracket, once fitted, remains attached to the lathe, but the bushing, together with the detent spindle, is removed, when not in use, to allow the belt cover to be closed. It would, of course, be possible to cut a gap in the belt cover to accommodate the complete fitting, but this would undoubtedly spoil the good appearance of the lathe ; however, as the detent is only occasionally used, very little time is wasted in fitting the bushing to the bracket. Finally, make sure that the tip of the detent fits accurately in the tooth spaces ; see that the spindle is rigidly mounted and free from rock when the locking collar is tightened ; always lock the spindle securely after disengagement before setting the lathe in motion.

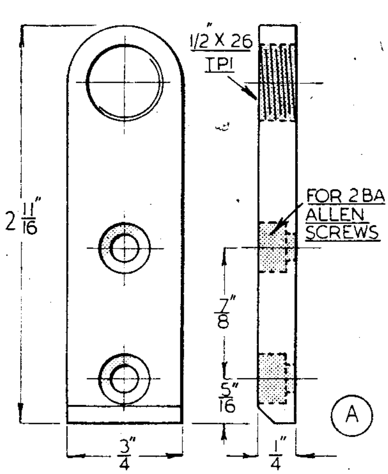


Fig. 6. Dimensions of the bracket

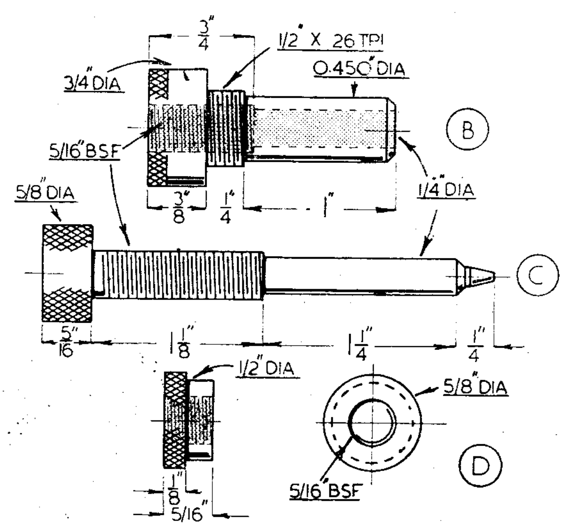
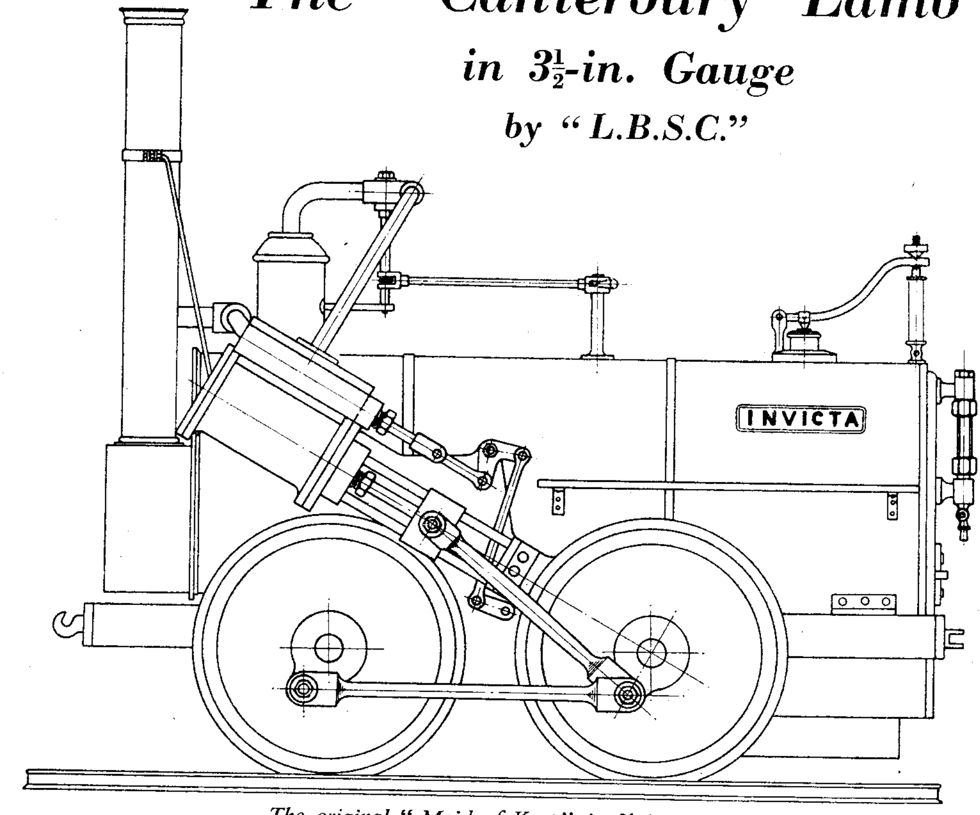


Fig. 7. The remaining components. Lettering as in Fig. 2

The "Canterbury Lamb"

in $3\frac{1}{2}$-in. Gauge

by "L.B.S.C."



The original "Maid of Kent" in $3\frac{1}{2}$-in. gauge

IMAGINE yourself in Canterbury on an evening in early September, 1984. Peace reigns over the world, bloodshed and destruction have gone for ever ; people come and go as they please, and the famous old Kentish city is thronged with American, foreign and Colonial visitors who have come to see the sights. " Let's take another look at old *Invicta*," you think, and make your way to the Dane Johns Garden, near the Market Place ; but the plinth is unoccupied, save for a big notice board, which reads :—

SOUTHERN RAILWAY
Re-opening of the Whitstable Branch

Visitors are cordially invited to take a trip over the first passenger-carrying railway in the South of England, in a " period " train hauled by the original locomotive *Invicta*, which opened the line in 1830. The train leaves Canterbury West Station at every hour, and returns from Whitstable at 30 mins. past the hour. Ordinary fare 6d. return. Visitors holding rail tickets to Canterbury, may travel free by showing their return halves.

Don't miss the thrill of a trip on " Ye Anciente Oysterville Expresse ! "

In the preceding January, the enterprising City Council, and the equally go-ahead directors of the Southern Railway, held a joint meeting, and decided to restore the old line, both for historic interest, and as a holiday attraction. The Civil Engineering Dept. relaid the line with modern rails, strengthened the bridges and culverts, opened up the old tunnel to full loading-gauge limits, and made new bay platforms at Canterbury and Whitstable stations. Old *Invicta* was taken from the pedestal where she had braved the British climate (and a few other troubles !) for so many years, and carted off to Ashford Locomotive Works, where Sir Roy Donalot and his merry men had thoroughly rejuvenated and modernised her, without impairing her original appearance. The Carriage and Wagon Works had built a train of " period " coaches, open type as per the original kind, but with comfortably-upholstered seats, and modern springing, the whole train being equipped with the quick-acting Westinghouse air brake. The coaches had concealed hoods which could be instantly raised in the event of a sudden shower. There was also a guard's van to match.

Humming the refrain of the old Cockney song, " We'll have to have a basinfull of that," you proceed to the station ; it is just ten minutes to seven, and a lovely evening.

You find the reincarnated old train in the down bay. There are the old period coaches, nearly

full of laughing holidaymakers and visitors; and at the head—yes, the old girl herself! There is no mistaking the long chimney on the biscuit-tin smokebox, nor the cylinders perched high on the sides of the boiler, nor the odd pairs of wheels; but she is resplendent in bright green, with black bands and gold lines, her brasswork is all polished, and her old-fashioned connecting- and coupling-rods shine like silver. She looks a mere pigmy beside *Lady Edith*, one of Sir Roy's Pacifics which has just pulled up at the opposite side of the platform with the 6 p.m. Charing Cross to Margate; but she is no whit inferior as far as her "works" are concerned.

Lady Edith greets her old sister with a cheerful "Whoo!" ere she departs with her fourteen-coach train; and as it is now almost on the hour, you take a seat in the old coach directly behind *Invicta*. The fireman, in period overalls and cap, cracks the blower, and the old spring-balance safety-valve starts to hiss; Tom A. Beckett, the old grey-whiskered driver, mounts his foot-board; the last few stragglers scramble aboard, and on the stroke of seven the guard waves his flag, Old Tom opens his regulator, and the old engine, with a loud "Om-m-m!" from her single-note whistle, slowly moves off.

All by Herself!

In the old days, the stiff gradients were worked by rope haulage, and the locomotive was only used on the level parts of the line; but the rejuvenated engine now scorns the idea of such working—she can do it all by herself! With deep sonorous beats from her tall chimney, she swings to the left, leaving the main line, and proceeds to tackle the heavy pull up to Tyler Hill. Old Tom pulls the throttle wide open, and Harry the fireman, bales in a few shovelfulls of black diamonds. The old spring-balance begins to buzz as she barges up the 1 in 41, and then plunges into the tunnel, with another blast of her whistle, and some "hooraying" from the children in the train. She is still accelerating, and the exhaust is now a thundering roar echoing through the tunnel vault, whilst a few stray sparks fly overhead. Out into the evening sunshine she comes, and finally tops the summit of the hill; once on the almost-level stretch, she rapidly gathers speed, and is soon doing better than a mile a minute across the green fields and through the Kentish woods. Soon old Tom shuts off steam, as the line drops sharply, and the train coasts for a mile or so; then he opens up again for another sprint over a mile-and-a-quarter of level road. The old engine seems to be thoroughly enjoying herself as she races along, the tall chimney swaying slightly, followed by the string of easy-riding coaches carrying the merry holidaymakers and laughing and cheering children. Old Tom shuts off once more for the final drop into Whitstable; as the train approaches the new junction with the Kent Coast line, he makes a slight brake application. The old train swings around the curve, and finally pulls up without jerk or jar, at the new bay platform at Whitstable Station, after an exciting run of ten minutes. "Coo!" remarks a London kiddy, "it's better'n the switchback in Battersea Park!" and many of the passengers stop to take a good look at the 150-year-old veteran, before leaving the station.

Well, so much for the fantasy; now, by kind permission of our friend the K.B.P., I'll tell you how to build a little *Invicta* which will perform in a similar manner on a $3\frac{1}{2}$-in. gauge line.

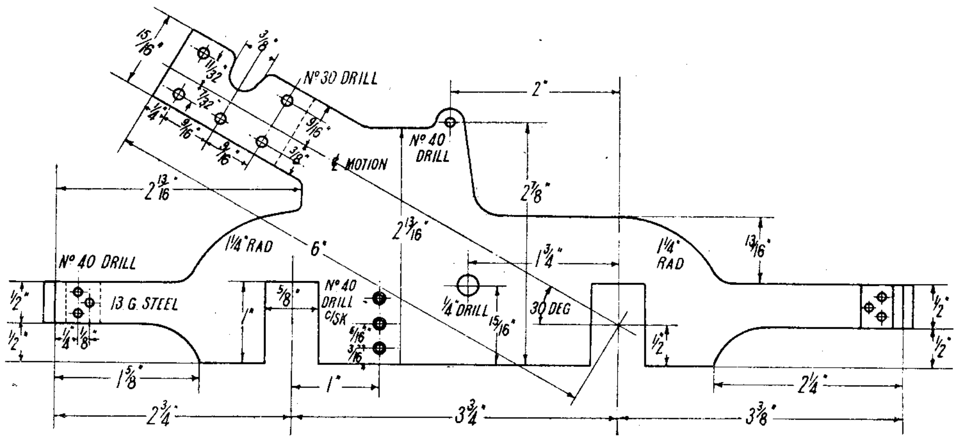
General Specification

Anybody who has seen the actual engine at Canterbury, or who has read a full description of her in any of the locomotive history books, will know at once that it would be a physical impossibility to make an exact copy of her in a small size, that would work in the manner usually expected of a job described by your humble servant, even if it could be made to work at all. She had a weird and wonderful frame made up of bars and angles, with plate supports at each side for the cylinders and guide bars. Her original boiler was similar to the *Rocket's*, with a little firebox tacked on to the back of the barrel, and a chimney with a swelled-out base covering the front ends of the tubes. This was later replaced by her present boiler, which has a Galloway type of firebox inside the barrel, and three big tubes leading to a smokebox like a little biscuit tin, on top of which the chimney was mounted. This boiler was a complete wash-out, and was the primary cause of her withdrawal from service, after a short life. She never worked through to Canterbury, on account of the heavy banks; she only had a short chimney, true enough, when lying derelict in the yard at Ashford, but I understood this was cut down to enable her to come through the tunnel after being taken out of service. The later South Eastern engines which worked on the branch, all had to be "cut-down" for the same purpose.

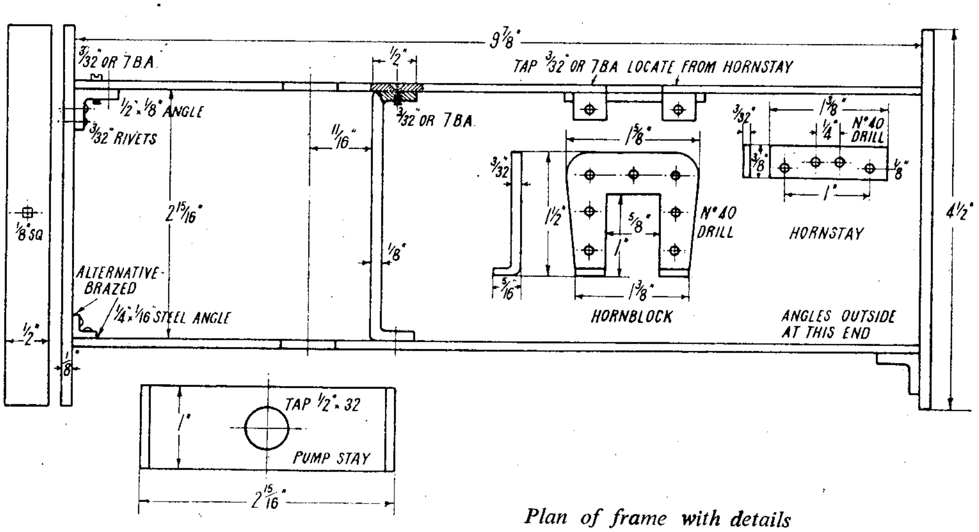
In the $3\frac{1}{2}$-in. gauge job, I have retained the principal characteristics of the old iron, but redesigned her to suit the size, and to make an efficient job of her. Plate frames, with an extension at the top to accommodate the cylinders, replace the original type. The hornblocks can be either castings, or cut from sheet metal (the latter are shown) with ordinary axleboxes and spiral springs. The ordinary kind of wheels may be used, though I shouldn't be at all surprised to find that our approved advertisers will be supplying the odd wheels, if there is a call for them; they are just about Angus Mc. Wilwau's cup of tea, he loves anything that is "out of the way." The leading wheels on the full-sized engine have split rectangular spokes, and the driving wheels have plain round spokes. There is a feed pump between the frames, eccentric-driven from the rear axle.

The cylinders are the same pattern that proved so successful on the other old iron, *Rainhill*, and are $\frac{11}{16}$ in. bore by $1\frac{1}{8}$ in. stroke; a bigger bore than full-size, but we are using a more efficient boiler, and as the whole weight is available for adhesion, we might as well take advantage of it. As in the original, the slide valves are on top; but the steam chest extends full length, to get modern ports and passages. The valves are

operated by loose eccentrics, as in full size, minus the complicated twin-lever reversing arrangement, which isn't necessary in 3½-in. gauge, and would be far too flimsy, anyway, to stand up to real work. The linkage between eccentrics and valves is shown clearly in the general arrangement drawing, and is robust. On the shaft of the lower crank, inside the frame, the smokebox end, so as to retain the "biscuit tin" and the literal stovepipe chimney; well, that was easy. The whole front pulls out, leaving a space in the barrel between the end of same, and the tubeplate. This contains the superheater headers and pipe connections. The steam pipe goes out through the dome, which is a dummy; the regulator is a plug cock in the



Frame plates



Plan of frame with details

there is a pendulum lever, to which the eccentric-rod is directly connected.

The boiler is of the correct locomotive type, the barrel being very little larger than "scale" diameter, as it has to fit between the cylinders; but there is room for an ample firebox at the back end, as the overhang of the "Galloway" boiler on the full-size engine was very considerable. I guess you'll wonder how I wangled tee carrying the branch pipes to the cylinders, and is connected to the driver's handle on top of the boiler, by a rod, as in the full-size engine. The exhaust goes to the chimney via another tee, with pack nuts to allow for easy removal of the front. The safety-valve is of the original spring-balance type, but of stouter construction. There is no footplate, as the driver stands on the side running-board, and the fireman on the

tender (the original arrangement, which was an anticipation of the American *Mother Hubbards* or *Camelbacks*) but we shall have to adorn the backhead with a modern water-gauge, clack-box, and blower valve, in the interests of general efficiency !

This old crock is going to be a very interesting job to build ; I don't believe there is a working *Invicta* in the world, in $3\frac{1}{2}$-in. gauge. Also, she will be inexpensive, and easy withal, so I shouldn't be surprised to hear of "Canterbury Lambs" being "born" all over Kent. She will haul an adult passenger easily ; maybe more, if the workmanship is good, and run at a speed that would have absolutely flabbergasted the builders of the original engine, had they been still alive. I'm open to bet that it won't be long before little *Invictas* are performing on the club tracks at Maidstone, Ashford and Tonbridge ! Now to construction.

Frames

Although these are more like bits of a jigsaw puzzle than respectable locomotive frames, they are easy enough to cut out, two pieces of 13-gauge or 3/32-in. soft steel (either blue or bright) being required, 10 in. long and 4 in. wide. Marking out, is just a kiddy's practice job if you proceed as follows. See that one long edge is quite straight, and set out the wheelbase on it, to dimensions given in drawing. Mark the rectangular axlebox openings, and centre-dot the position of axles as shown, right in the middle. Draw a horizontal line through the rear one, parallel with bottom edge of plate ; then from this line, using the dot as starting point, draw a line sloping up at an angle of 30 deg. This is an exercise in rudimentary geometry that any third-standard council-schoolboy can do ; but most small drawing-squares have three angles, 30, 60, and 90 deg., so if you have one, all you have to do is to apply it with the sharpest point to the centre-dot with the edge parallel with the horizontal line, run your scriber up the sloping edge, and Bob's your uncle. At 6 in. from the centre-dot, draw a cross line at right angles to the diagonal line, and that will indicate the end of the extension carrying the cylinders ; set out from it, the rectangle shown, and the gap for the exhaust pipe.

Now strike the two radii shown, from the axle centres, using your dividers set with the points $1\frac{1}{4}$ in. apart. Next, set out the two narrow ends of the frame, and join up to the lower ends of the radii, and the bottom edge of frame. Finally, dot the position of the bell crank spindle, 2 in. ahead of the driving axle centre, and $2\frac{7}{8}$ in. above the bottom edge of frame ; draw the little arch over it with the dividers, and join up the loose ends to the outline shown. Mark out the position of the screw-holes ; drill a couple of them, rivet the unmarked plate to the marked one, then saw and file to outline, and drill all the holes through both plates. The countersinks on the holes for the pump-stay screws will indicate which is the outside of the plates.

Beams, Hornblocks and Pump Stay

The beams are $4\frac{1}{2}$ in. lengths of $\frac{1}{2}$ in. $\times$ $\frac{1}{8}$ in. flat steel ; the front one has a $\frac{1}{8}$ in. square hole in it for the drawhook, and the back one is tapped $\frac{1}{8}$ in. or 5 B.A. for the drawbar fork. The pump stay may either be a casting, or built up ; if the former, it will need filing or milling on the ends, to an overall width of $2\frac{13}{16}$ in. A built-up one may be made from 1 in. $\times$ $\frac{1}{8}$ in. brass or steel, either with bent-over ends as shown, or with pieces of angle, say $\frac{3}{8}$ in. $\times$ $\frac{1}{8}$ in., riveted on. A $\frac{1}{2}$ in. $\times$ 32 hole is needed in the middle.

The hornblocks may also be castings, or cut from 3/32 in. sheet brass or steel. If castings are used, they need have no flanges to fit in the openings in the frame, but may be quite flat on the contact side, and fitted to the frames in the same way as shown for the plate hornblocks. The latter need no description, as the illustration explains itself. Either type is riveted to the frame by seven 3/32-in. iron rivets, countersunk and filed flush on the outside of the frame. The horn-stays are $1\frac{3}{8}$ in. lengths of $\frac{3}{8}$ in. $\times$ 3/32 in. steel, drilled as shown, and are attached to the horn-block feet or lugs by 3/32-in. or 7-B.A. screws ; any heads will do.

The frames may be attached to the beams by pieces of $\frac{1}{2}$ in. $\times$ $\frac{1}{8}$ in. angle, with rivets and screws as shown ; this method of attachment was fully described in the *Tich* notes. They may also be brazed ; but as the beams are made from bar instead of angle, they must first be attached to the frames by small pieces of angle, which may be bent up in the bench vice from odd scraps of 16-gauge steel. These are not required where angle beams are used, as on *Tich*, as the frames may be brazed direct into the slots in the top members of angle beams ; but in the present instance they are essential. The frames and beams should be temporarily clamped together by toolmakers' cramps (which may be home-made in a few minutes each), and the frames lined up on the lathe bed, or something equally flat and true, before drilling the holes and putting the rivets or screws in. The pump stay may be fitted before the corners of a brazed frame are brazed up, as this will help to stiffen the whole assembly, and prevent it from distorting under the heat of the blowlamp or blowpipe.

Note : the angles at the rear end of the frame assembly, should be placed *outside* the frames, as shown. The reason for this, is that as there is no footplate at the trailing end, the boiler comes right up to the back beam ; and if the angles are fitted inside, the firebox wrapper, which is $2\frac{7}{8}$ in. wide outside, won't fit in between the frames, close to the beam. Next items, axleboxes, wheels and axles, eccentrics and pump.

Tail Lamp

There had been wholesale thefts of leather window straps from carriages on the old S.E. & C.R., so when the schoolboy who had just started to learn French, boarded the boat train for Dover, and saw the "Don't lean out of the window" notice in French, *Ne pas se pencher au dehors,* just under the carriage window, he promptly translated it "Don't pinch the skin of the horse !" Unofficial history tells us that it was the same boy who translated *Sic transit gloria mundi* as "You'll be gloriously sick if you travel on Monday."

MAKING SMALL FOUNDRY PATTERNS

by E. W. Twining

ALTHOUGH it is chiefly for model-making purposes that this article and the accompanying drawings have been prepared, the basic principles described are equally applicable to very much larger work. In other words the model maker, particularly if the model he is working on is to scale and a replica of a full-size machine, must follow, fairly closely, the methods and practice adopted in the building of the prototype.

In some cases, however, this principle only spokes, finishing with fine files and glasspaper. This method applies in diameters up to from three to four inches and then only if the castings are going to be made from them immediately; for however well seasoned the wood may be, shrinkage across the grain is almost certain to take place, so that the wheel will, in time, become slightly elliptical and then difficulty will be experienced in so machining a later casting that the resulting wheel is truly symmetrical at all points around the rim, or tyre.

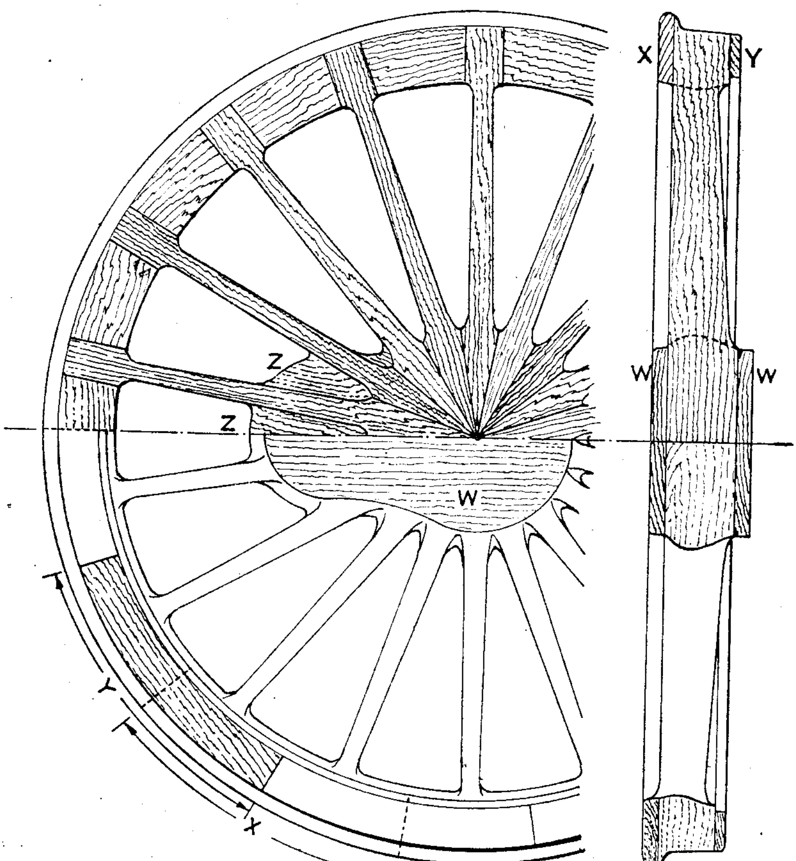


Fig. 1. A pattern for a locomotive driving wheel

applies in large models; for instance in the case of making patterns for gear wheels, flywheels and locomotive wheels. In small scale models such patterns can be turned from solid discs of wood to their cross sectional profile and then fret-saw pierced for the spaces between the

The best wood to use for all small patterns is Spanish or Honduras mahogany and, if at all possible, new wood should be avoided. The most durable is that cut from old, damaged, or otherwise beyond repair, mahogany furniture, table tops, legs, rails and such other parts as

may be large enough.

The method which is best to follow in the making of patterns for very small-scale wheels, especially locomotive wheels, is to build them up in metal, using a cast brass-ring for the rim and tyre and a piece of rod for the hub ; then, using brass strip for the spokes, build the wheel up in a steel jig, silver-soldering the spokes to both hub and rim. Each spoke would, of course, be filed to correct profile and cross section before being inserted into notches prepared for them at their inner and outer ends. Cranks and balances can be soft-soldered on the faces of hubs and spokes. This makes the most durable pattern possible and there is no risk of breakage whilst the moulder is ramming the sand in the moulding box.

Patterns for large scale wheels should be built up in mahogany in the manner shown in the elevation and sections : Fig. 1. Very few woods have the property of shrinking longitudinally with the grain (I know of only two or three and they come from the Antipodes) and therefore as, in the pattern shown, the grain runs lengthwise in every piece, the whole will stand up to diameter and truth almost indefinitely.

The rims are formed by the outer ends of the spokes with pieces inserted between and with thin facing segments *X* and *Y*, glued on. There will be, for an 18-spoked wheel, nine of these segments on each side, in positions staggered in relation with each other, as shown in the front elevation. Each of all the segments must have the grain running the longest way of the wood. Crank webs will be provided by the small pieces *W*,*W*, added on each side to form the bosses of the hub, with little bits of wood, *Z*, *Z*, glued in between the spokes. Balance weights will have to be detachable, if it is desired to avoid the necessity for making two patterns, or more, for the driving and coupled wheels.

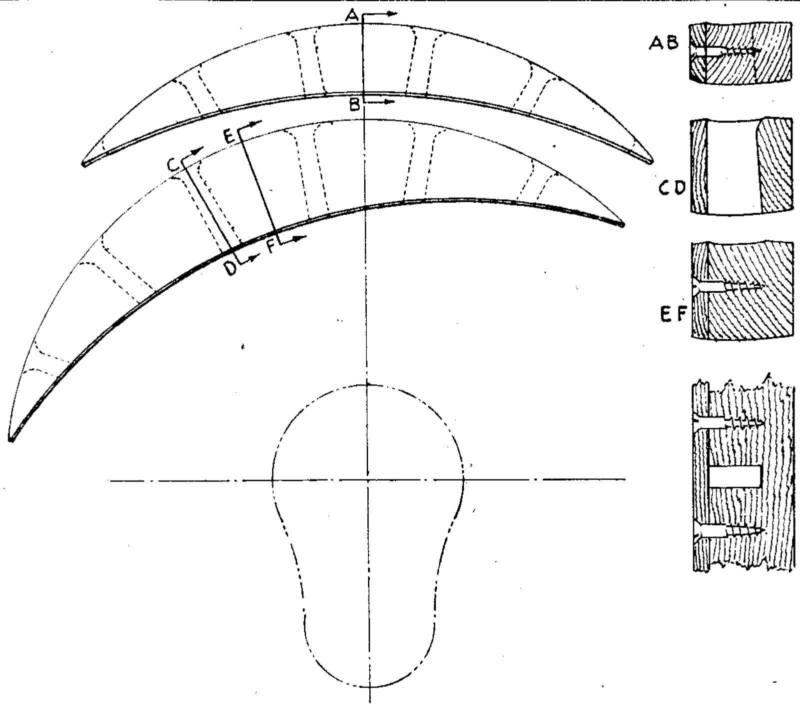


Fig. 2. Patterns for driving-wheel balances

The best way is to make one wheel only and then prepare patterns for separate balances applicable to and detachable from the wheel. If the locomotive has six coupled wheels : a 4-6-0 or a 4-6-2 type, with three or four cylinders, then three different sizes, and different positions for the balances will be needed. These can be shaped in mahogany in two pieces, divided longitudinally, one of them to saddle over the proper number of spokes. They will be secured by brass countersunk screws from the back of the wheel, as drawn in Fig. 2, and will not, of course be glued in any way, since the balances must be interchangeable.

Bogie, radial truck and tender wheels, over say three inches in diameter, can be made in the same way as driving wheels or, for the sake of simplicity, can be turned and fretsawn from the very best, aircraft quality, plywood. If the best is not available it is better to build up in mahogany, since, with inferior quality the several plies are apt to separate, especially in wheel spokes, and the whole becomes warped and out of truth.

Large diameter spoked flywheels for stationary

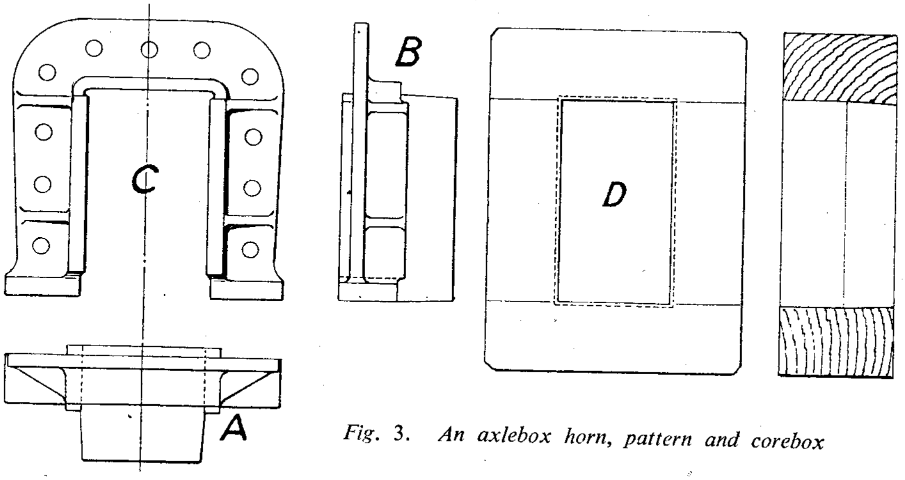


Fig. 3. An axlebox horn, pattern and corebox

engines should be made in the same manner as I have described for locomotive driving wheels and this also applies to patterns for large, toothed gear wheels.

Model locomotive axlebox guides are usually cast from simple, open patterns of inverted U-shape, for driving and coupled wheel axles, but these are inclined to be weak and are liable to become distorted or broken when ramming in the sand. By far the best way to make them is to use a plain, thin piece of mahogany and then add pieces on either side, finally putting on a print of the correct size for the opening, that is to say a piece slightly smaller in width than the axleboxes to allow for machining or filing. Such a pattern is drawn in plan *A*, Fig. 3, whilst *C* is a front view of the finished horn and *B* a side view of the pattern, which, with *A*, shows that the print for the core need be on one side only. The shapes of the horns at the bottoms of the guides will, of course, depend upon the type of hornstay to be used and these again upon whether the engine springs are above or below the axles.

With such a pattern the moulder at the foundry will require a corebox and this can be a simple rectangular frame, open on both faces. The depth, width and height of the opening must exactly equal, or perhaps be very slightly less than the corresponding print on the pattern. A sketch of the box is added at *D* in Fig. 3. It is needless perhaps to say that all the inner faces of the box must be dead square and parallel.

The method of treating the making of model boiler mounting patterns : chimneys, domes and valve casings, depends largely on the type and period of engine being modelled. With modern high-pitched boilers the pattern for the dome casing can be made exactly like the casting is required to be but, to reproduce the beautiful taller domes of earlier engines it will be necessary to make the pattern solid with a good long print as drawn at *A* in Fig. 4, and then to make a corebox, in which the moulder will make a core, which he will lay in the impression left in the sand by the dome and its print, and around which core the molten metal will flow. The drawing shows the corebox, *A*1 beside the pattern *A*.

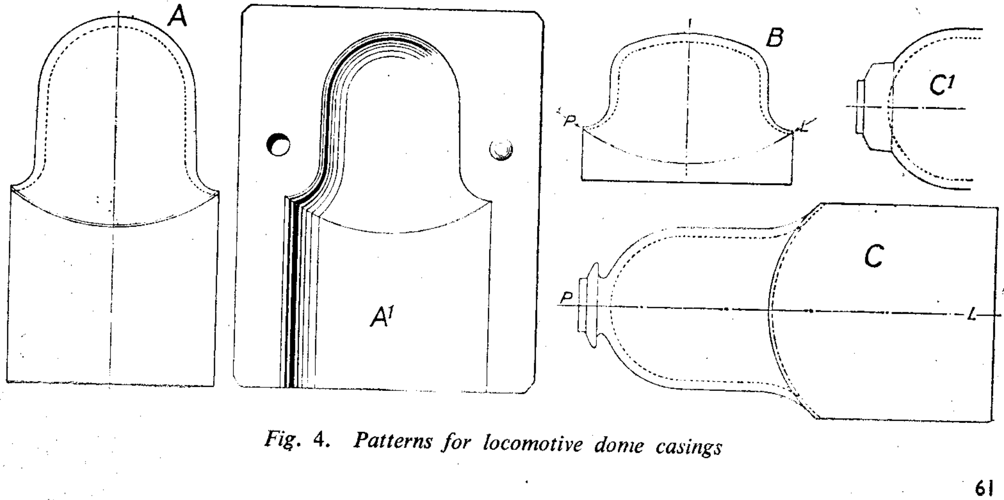


Fig. 4. Patterns for locomotive dome casings

I have mentioned a "long print" but actually this length determines the way in which the moulder will place the pattern in the sand. The long print is required in the case of moulding horizontally. If the dome is of the somewhat later, flattened topped type, such as that on Ivatt's G.N.R. Atlantics, as at *B*, the print need only be short and the moulder will place the pattern and cast in an upright position, with *P.L.*, as a parting line, as he may possibly decide to do in the case of *A*; but if one of S. W. Johnson's Midland engines were being modelled, with an ornamental top to the dome, as at C, then moulding and casting would have to be done horizontally and the print would definitely have to be long in order to avoid any possibility of the dome end of the core sagging downwards. In other words the print end of the core must be the heavier and the cylindrical portion make a good fit in the impression left by the print in the sand. This principle applies equally to many other things in model as well as bigger engineering. In the case of *C*, in Fig. 4, an alternative would be to make a short print, let the moulder use the pattern vertically and, in the pattern form the top like *C*1. This means that the deep hollow, or groove, would have to be turned in the casting.

Locomotive chimney patterns also have to be dealt with according to the height of the prototype, and there is too the matter of the extension downwards into the smokebox. For over sixty years engines have been fitted with these extensions, or petticoats, and they are just as necessary in a coal-burning model as they are in full size practice; the only question is; shall such extension be cast in one piece with the chimney or made from sheet or tube metal and fitted separately? I am strongly in favour of casting as one unit, because it ensures perfect form and alignment internally.

In Fig. 5 is shown, at *A*, a cast chimney of medium height; at *B* the pattern, and at *C* the corebox for the same. Here it will be seen that the core goes right through, so that when it is in the sand the core is supported at both ends, for the chimney will be moulded and cast horizontally, with the parting line *PL*, at right angles to the centre-line of the engine. The corebox will be made in two halves with short dowel pins to hold the two halves in alignment whilst the moulder is ramming the core. By the way, dowel-pins can be of metal or hardwood; they should, if of wood, be glued into one half of the box and make a nice sliding fit in the other. Sliding pins and the holes they go into should be black-leaded.

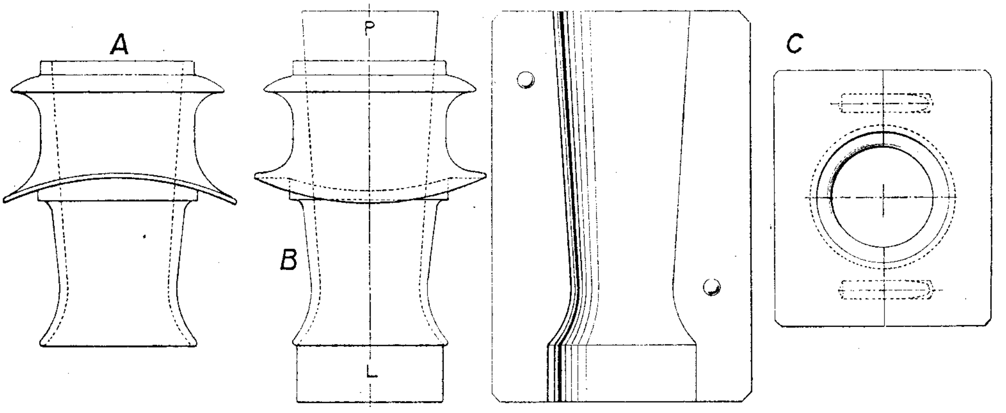


Fig. 5. *A locomotive chimney*

In making such a chimney pattern, as I have shown, care must be taken to see that the bell mouth of the extension is a sufficient amount smaller than the base of the chimney itself as will give a wide enough margin of metal on the base to enable it to be riveted or screwed to the smokebox wrapper plate. Obviously the hole in the plate must be large enough for the bell-mouth to pass through.

If the engine which is being modelled has an ornamental casing over the safety-valves this, in the model, will be dealt with in much the same way as would a chimney from which the extension is absent.

The patterns for the cylinders of a working scale model present to the model maker a difficult problem, and the problem is how to get the largest port sizes, piston valve diameters, exhaust clearances, etc., so that the maximum power and efficiency can be got from scale overall dimensions and correct appearance. I am fairly well convinced that to use piston-valves on cylinders up to $1\frac{1}{4}$ in. diameter by $2\frac{1}{8}$ in. or $2\frac{1}{4}$ in. stroke, the best way is not to use castings at all, but to build them up with steel or brass tubing and plate work, as I did in a pair of cylinders which I designed a couple of years ago. However, that is by the way; we are dealing here with foundry patterns, and so I must endeavour to show how patterns should be made for producing such cylinders from castings; which castings I shall presume will be in gunmetal for non-rusting reasons.

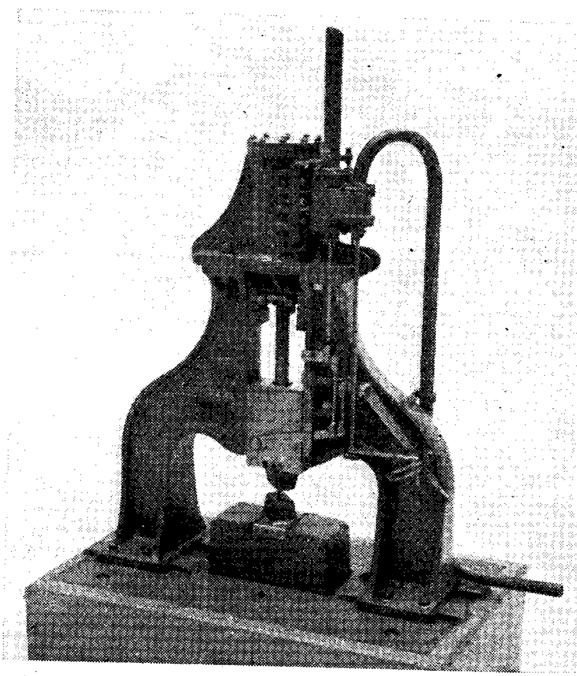
(*To be continued*)

A Working Model Steam-Hammer

A description of a most unusual "first attempt"

by "Northerner"

AT the 1952 Northern Models Exhibition, an unusual model was the 1 in. scale "Massey" 20-cwt. steam-hammer of the self-acting type, of period about 1920. This model was built, as a first attempt, by Mr. F. J. Haynes, of Manchester, who used to drive the prototype, when a boy of 14, at Armstrong Whitworth's. It was used for the cogging, or drawing-down, of high-grade tool steels from ingots.



Photograph No. 1. A fine working model steam-hammer built by Mr. F. J. Haynes, of Manchester. In this photograph the upper pallet is supported by a small piece of wood

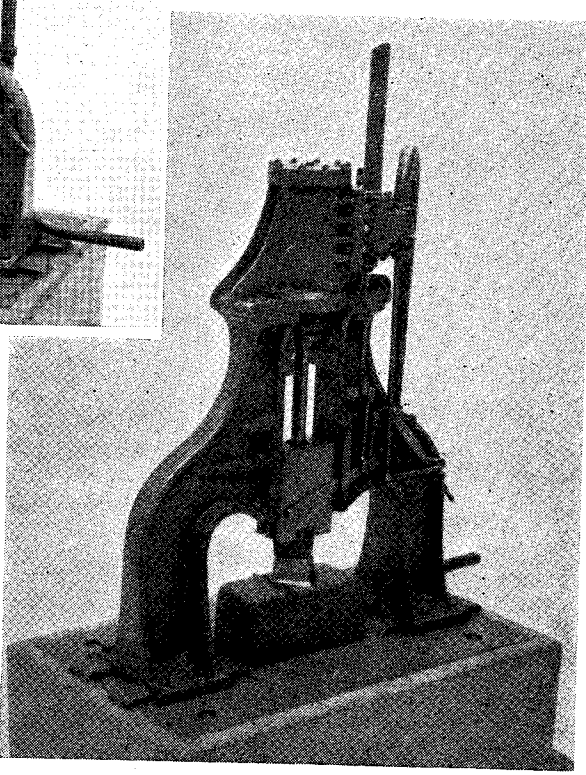
The model was awarded first prize in its class, and was built from drawings kindly supplied by the makers, Messrs. B. & S. Massey, of Manchester. During the exhibition it was frequently seen working under compressed air, which added greatly to the interest.

The hammer itself stands $12\frac{1}{8}$ in. high, without foundation and exhaust pipe, and the foundation plate is 11 in. × $6\frac{1}{2}$ in. The bore of the cylinder is $1\frac{3}{8}$ in., and the maximum stroke is 2 in.

The cylinder is built from bronze castings, with separate brass side supports silver-soldered on. A solid piston-rod is used, as is usual for this type of hammer; the bottom end of the rod is larger in diameter than the upper part, and is turned to a taper, which is driven into a matching hole in the tup. This hole is drilled right through the tup, incidentally, so that the rod can be drilled out if necessary. Both rod and tup are steel.

The main standards are iron castings, with steel vee-slides fitted in which the tup works, and the bottom block is also an iron casting, weighing about 20 lb. Mild-steel plates and bars, riveted together, are used for the foundation plate.

Two steel "pallets" are fitted to the tup and bottom block respectively, by



Photograph No. 2. Note in this photograph the wooden blocks fixed just below the cylinder, to prevent the tup rising too far in case of a defect in the valve-gear

means of dovetails and driven keys. They are placed at 45 deg. to the tup, the reason being that the cogging down is done in line with the narrow part, but the steel is smoothed off on the wider axis.

Valve Gear

Movement of the tup is controlled by a bronze piston-valve working in a steel liner, in which ports are cut for admission and exhaust of steam. The main valve is worked from the tup, by means of links and levers, and the force of the blow may be varied by adjusting the bell-crank hand-lever, which may be locked in any position in its radial guide.

Stopping and starting are controlled by a separate valve, with a separate hand-lever. Pressure needed to work the hammer is only 5 lb. per sq. in.

The Builder

Mr. Haynes is now a maintenance engineer. Building the model took about six months of spare-time work, and all the machining was done on a $3\frac{5}{8}$-in. lathe. Mr. Haynes is now building the dividing-head recently described in THE MODEL ENGINEER by A. R. Turpin. If it turns out as well as the hammer, it will be a useful addition to his workshop, and perhaps we may see it at next year's N.A.M.E. Exhibition. Certainly, I look forward to seeing Mr. Haynes' future work in model engineering.

PRACTICAL LETTERS

Catching 'Em Young

DEAR SIR,—I feel as an old reader of THE MODEL ENGINEER that I should like to dash into print with the conviction that model engineers are born and not made. As evidence I produce my grandson David who, at the age of 3 years and 5 months, has constructed unaided, his first model. To wit, a motor trailer, he calls it. It is only a small flat piece of wood but he has fixed four metal wheels on and a cup hook in the front to tow it with. A small thing no doubt, as models go, *but every part is in correct alignment and he measured and marked the place for his small hook*, and made his holes by knocking nails in with a hammer, pulling them out with pliers to enable him to fit the wheels on.

Surely this is inspiring in these troublesome times.

Yours faithfully,

Bradford. J. C. HALL.

Hand Scraping

DEAR SIR,—In offering some criticism of an article by one of Mr. L. H. Sparey's repute, I may be "sticking my neck out" but I cannot refrain from doing so. Despite the inference to be drawn from his article, I would assert boldly that the production of a good surface plate by hand scraping (whether from a master plate or the three-plate method) does *not* call for great skill—the chief requirement is patience, and plenty of it. The best set I have ever seen, in a precision tool factory, were scraped by a team of girls who had no previous experience of the work. These plates, generated by the Whitworth method, were approximately 3 ft. 6 in. × 2 ft. 3 in. and when completed and placed in contact dry, any two of them could be lifted together by a crane connected to the upper plate only.

I have known several machine tool maintenance fitters attached to works producing work of high precision, and not one of them used a scraper of the form advocated, nor have I ever seen it on a new tool by any manufacturer. The greatest negative rake I have seen in use is given when the front of the tool is ground at right-angles to the centre-line and the cutting edge is thinner than the body of the tool. In this case two cutting edges are formed at each grinding. The negative rake here would be 1.5 to 2 deg., and bears no resemblance to that shown in Figs. 2 and 3 of the article. Most fitters prefer a slightly curved edge, which would be virtually impossible to hone in the manner shown in Fig. 5 of Mr. Sparey's article.

The remark about "a little practice being required to attain perfection" in this operation is about the most masterly understatement I have encountered up to date. In making a scraper from a worn file, the tool should first be completely ground off for 2 in. to 3 in. from the front *before* forging.

The most astonishing statement I have seen in THE MODEL ENGINEER for years is that in reference to easing slides. It states—"the surface is assumed to be flat in the first place." I have learned from bitter experience and at the cost of many hours of waste work that no greater mistake can be made than to "assume" that any surface is "flat," "truly circular," "in true alignment" or what have you, particularly where the correctness of such an assumption can be tested fairly easily. The only safe advice to those who want their work to be right is to take nothing for granted. Test the assumption for yourself, and then you will *know*.

Incidentally, I have in use a flat scraper with tungsten carbide tip made for me by Messrs. A. C. Wickman. This was supplied with considerable *positive rake*; I had given no instructions on this point. It is also slightly curved on the cutting edge, and works at a much more acute angle than shown in Fig. 4 of Mr. Sparey's article, with very light pressure. It has yet to be resharpened for the first time, and the next time I get a dig in with it will be the first!

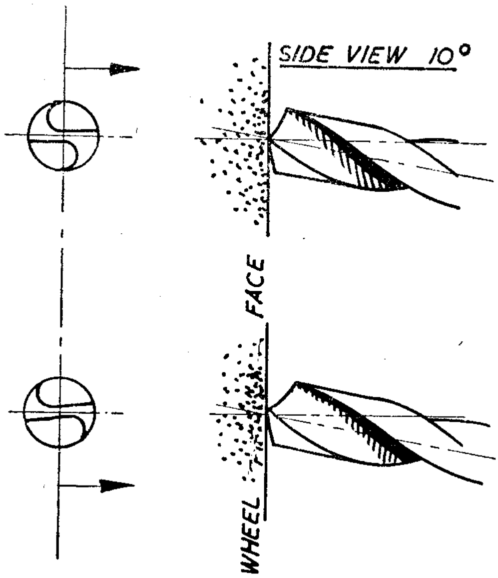
Yours faithfully,

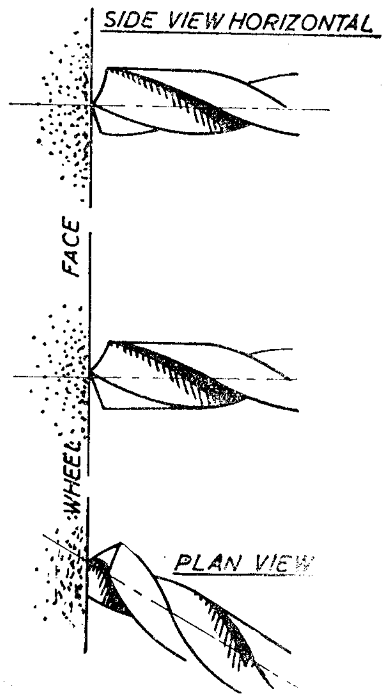
Seascale. K. A. HELLON.

Twist Drill Point Grinding

DEAR SIR,—What a remarkable journal THE MODEL ENGINEER is ; full of surprises and with a readership of awe-inspiring knowledge and experience.

Here is Mr. H. J. Marcoolyn pointing out (May 1st, 1952) that once again a basic idea is





forestalled in an early issue of THE MODEL ENGINEER. I do not have the issue for December 11th, 1941, Vol. 85, to which he refers and would be glad to purchase it from any reader having a copy for disposal.

I hope soon to submit for the Editor's consideration what I regard as the simplest way of constructing the drill point grinding device I am developing.

As to Mr. Marcoolyn's comment relating to the 10 deg. presentation angle, that was provided as something of an insurance policy. It seemed possible, in theory, that if the drill point is swept round horizontally set, the cutting edge, the precise leading extremity, would be square to the axis of the drill. Also, that if there were any inadvertent dwell before the cam took control, a flat might develop at the cutting edge, resulting in absence of relief there ; at 10 deg. inclination a dwell would not prevent clearance being obtained.

In this connection some control can be exercised whether at an angle or square set, by locking the drill with the cutting lip a shade above horizontal centre-line. Perhaps the sketches will explain my meaning here.

My thanks to Mr. Marcoolyn for his complimentary remarks.

Yours faithfully,
W. D. ARNOT.

Bristol.

Active Showmen's Engines

DEAR SIR,—In "Practical Letters" of May 29th issue, Mr. Edwards said it would be interesting to know if any showmen's traction engines were still giving active service as such.

There are, I believe, only four engines now doing their original jobs ; there may, of course, be one or two others, but these four are probably "the last of the line."

Three of these engines still in use are owned by Mr. Pat Collins, the well-known amusement caterer, two of them being Burrells—"Burrell No. 1" and *Griffin*—whilst the third is a Maclaren engine named *Goliath*. These engines are at present in the Birmingham area, with the amusements.

The fourth engine is another Burrell, named *William the Fifth*, now travelling, I believe, with Messrs. Bottom Bros. amusements.

Another piece of interesting information has come to hand recently concerning the Burrell No. 2984, owned by Miss S. Beach, named *Lord Fisher* (photo., "M.E.," May 19th, 1949).

On Sunday, May 11th, this engine was loaded at the fairground, Regina Road, Southall, on to a Scammell lorry to commence her long journey to Manchester, where she is to spend her last days in the hands of her new owner, an ardent steam fan. There is still one other engine at Regina Road, Southall, this is the small Burrell, *May Queen*, which also seems to be on the retired list.

Yours faithfully,
S. MORGAN.

Yeovil.